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Personal Computing

OCTOBER 1978

'78 Midwest Personal Computing Expo Show Survival Kit, p. 63

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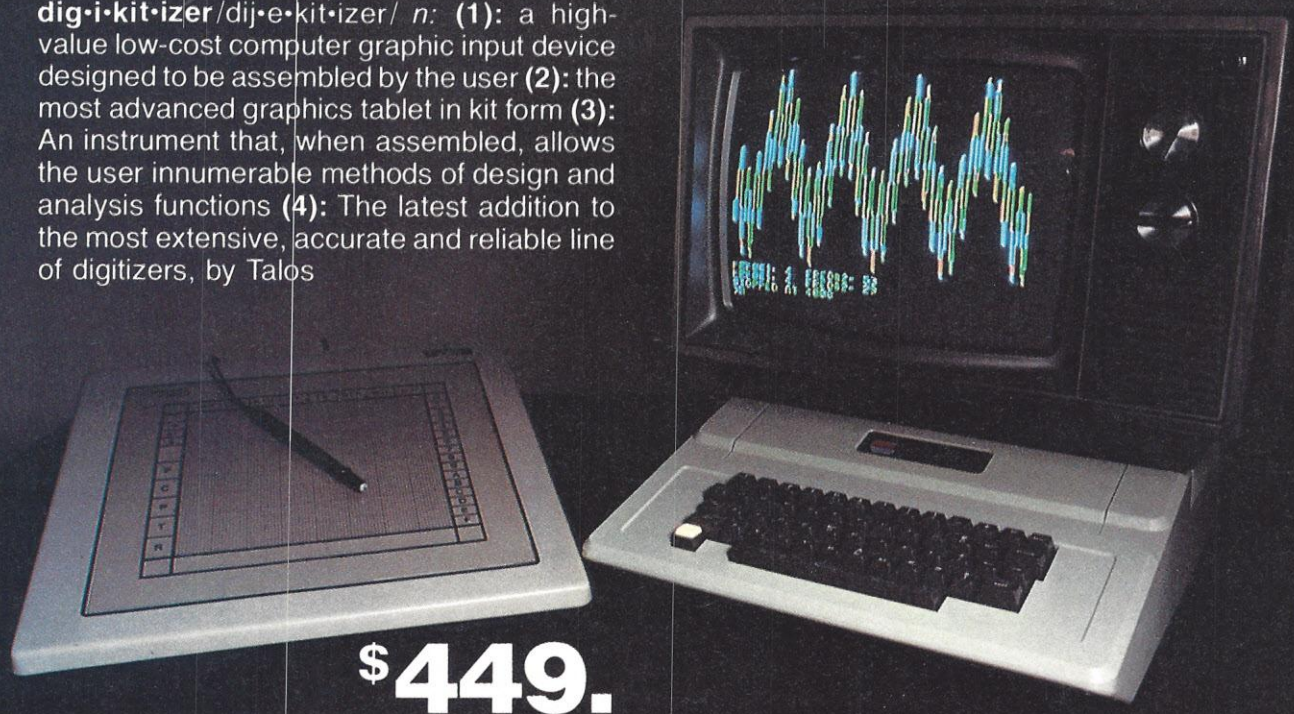

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CIRCLE 1

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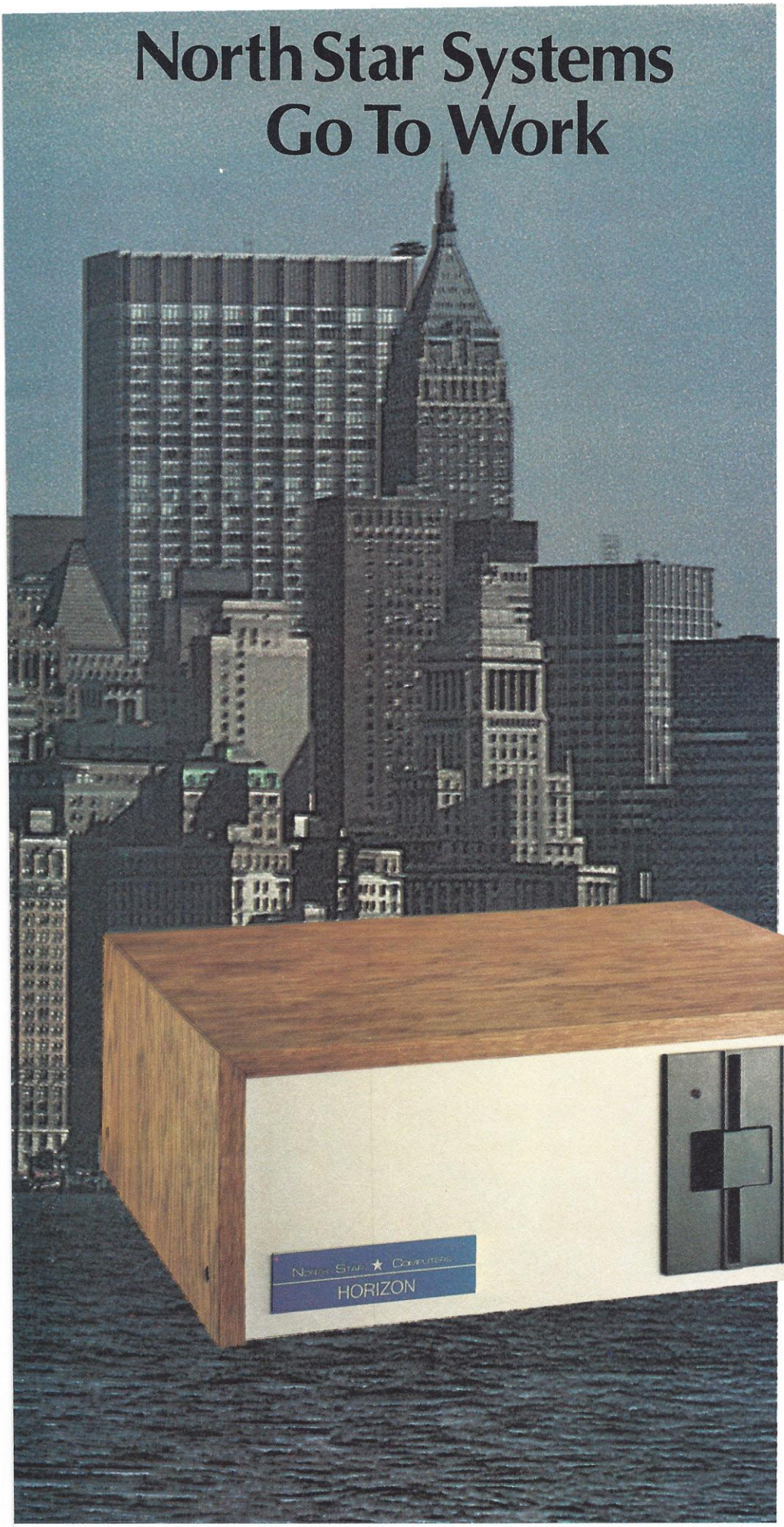

More and more, you see the North Star HORIZON computer at work: in business, research, and education. Its high performance qualifies the HORIZON for demanding professional applications. Over 10,000 users during the past two years have proven that North Star hardware has the reliability for day-in, day-out computing. The HORIZON is now a serious candidate for any small system installation.

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CIRCLE 4

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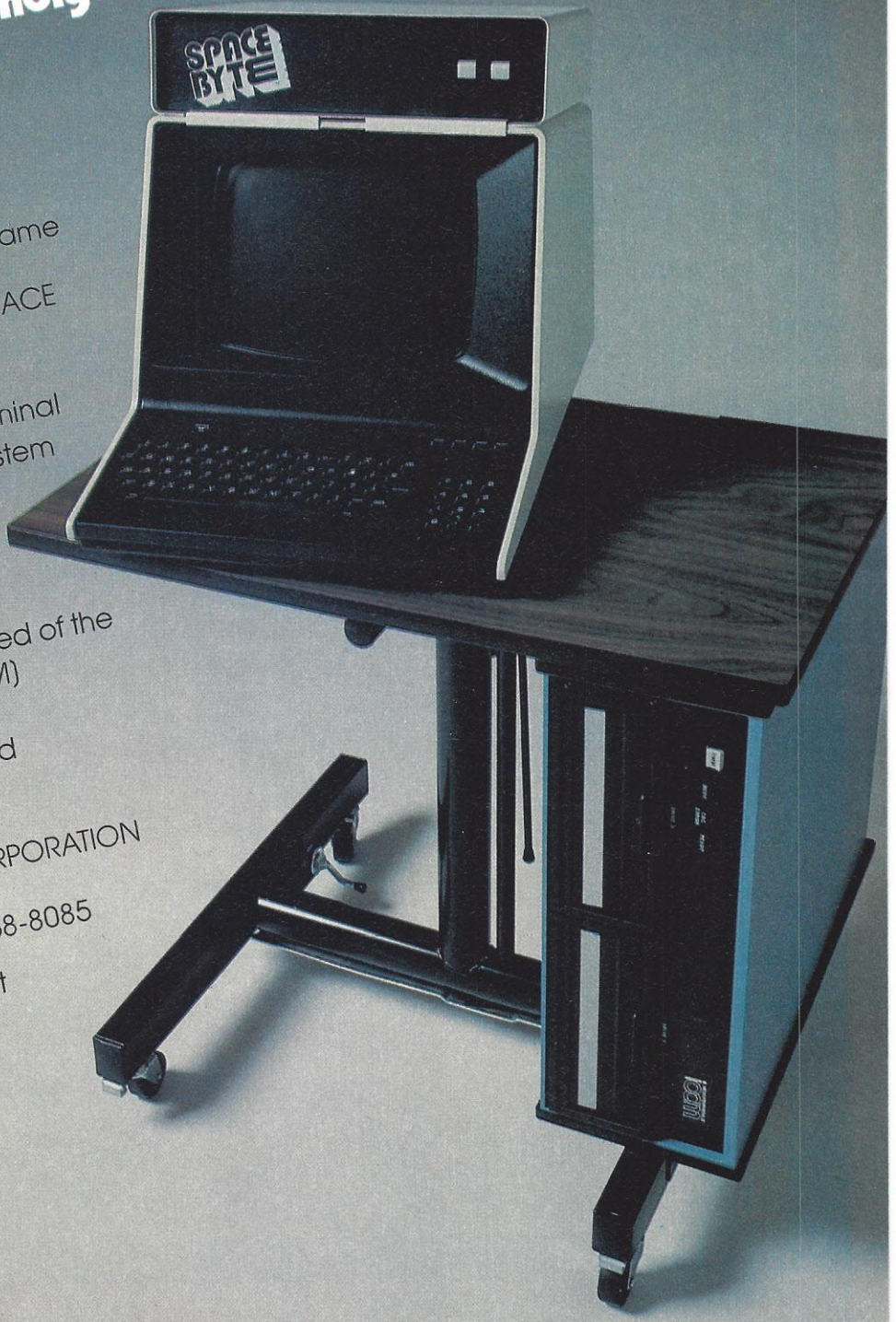

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Personal Computing

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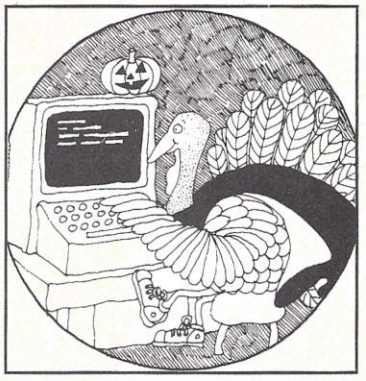

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Cover illustration by Penny Carter

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COVER STORY

PREVIEW: SECOND ANNUAL MIDWEST PERSONAL COMPUTING EXPO 63

Personal Computing magazine's '78 Midwest Personal Computing Expo, to be held in Chicago October 5 to 8, will emphasize practical, cost-cutting innovations for home, small business and professional microcomputer users. This year's show, expected to draw more than 20,000 attendees, will feature seminars by leading figures in the personal computing field as well as exhibits of equipment and new products by the nation's leading microcomputer companies. Check out the exhibitors, seminars and special events in this Show Survival Kit.

LAUNCHING PAD

GRI KEYBOARD: AN IDEAL BEGINNER'S KIT 90

Thought about buying a computer kit – but afraid you really don't have the skill, patience or personality to build the darned thing? Why not start out small? Building this inexpensive, simple kit will tell you if you're suited to tackling the larger project. And when you're finished, you'll have one essential item for your system ready to go. *by William L. Colsher*

DIGGING IN

THE GRIVET 39

The Grivet is a device designed to add hands and feet to your microcomputer. Use your imagination to teach the Grivet to perform simple human chores such as pouring coffee, vacuuming rugs, answering door bells and threading needles. It is *not* a robot, says the inventor, but a new class of peripherals. *by Harry Shershow*

IN THE MONEY

THE COMPUTER CHECKS INTO THE BALANCING ACT: PART II 43

This Check Register Accounting System – CRAS – does much more than balance your checkbook. A single entry for each transaction produces many specialized outputs. *by O.E. Dial*

I'LL PUT YOU ON HOLD AND CHECK 54

This simple inventory program for small businesses lets you recall information about your inventory by stock number or item name. The computer will print out the item's location in the stockroom, the cost per unit, cost per case, number per case and when the next shipment is due. *by Ray Vukcevich*

ON THE LIGHTER SIDE

TECHNO TURKEY AND THE HAUNTED HOUSE 24

Our intrepid bird decided to use the latest modern technology to conjure ghouls, ghosts and goblins to scare the bejabbers out of neighborhood kids. While turning his humble home into a computerized haunted house, Turkey realized the sensing and control devices he used could also let his computer control practical, real-world applications. *by Lloyd R. Prentice*

SCROLLING WITH AN UNSEEN HAND 61

Computers are fast – sometimes too fast. This simple programming technique slows down the output to your CRT, so the words appear on the screen letter by letter as if written by an unseen hand. Used in moderation, scrolling produces dramatic effects in games and other programs. *by Karen S. Wolfe*

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CIRCLE 6

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ELF II GIANT BOARD™ with cassette I/O, RS 232-C/TTY I/O, 8-bit P I/O, decoders for 14 separate I/O instructions and a system monitor/editor • 4k Static RAM. Addressable to any 4k page to 64k • Prototype (Kluge) Board accepts up to 36 IC's • Gold plated 86-pin connector • Expansion Power Supply (Not required unless adding 4k RAM) • All of the above PC boards plug directly into ELF II's expansion bus.

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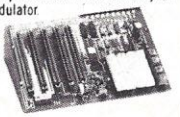
☐ $14.95 for ELF II Tiny BASIC cassette.



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CIRCLE 7

Personal Computing

OCTOBER 1978 Vol. II, No. 10

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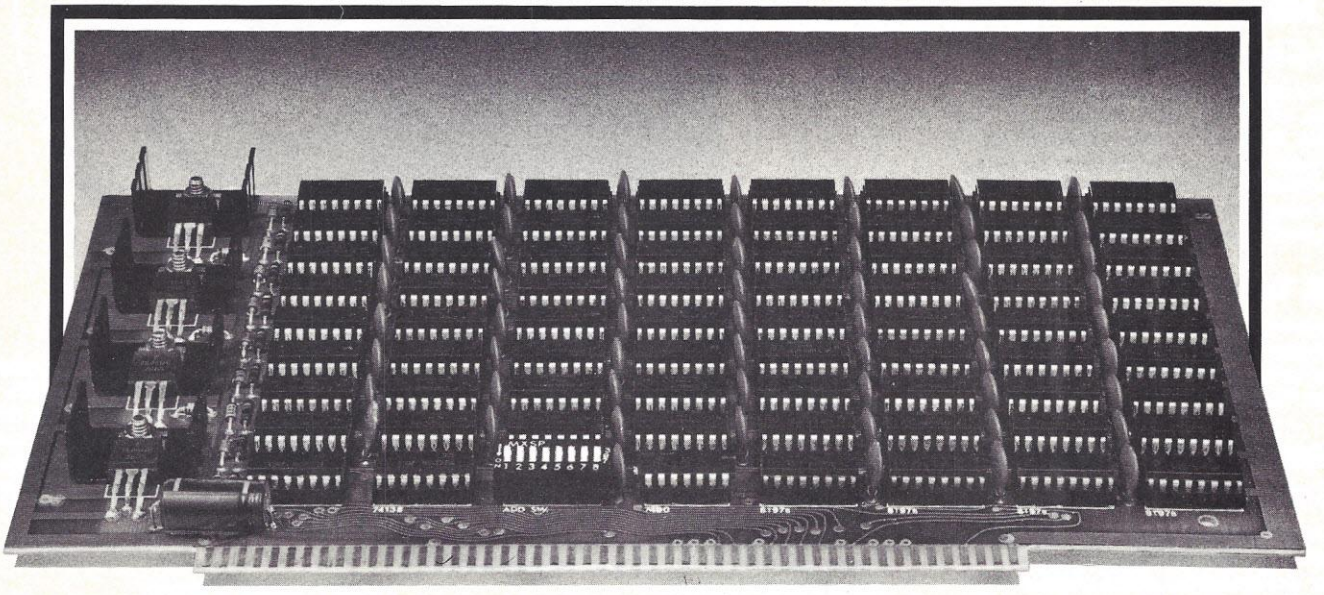

The amazing SEALS 8K memory

April 1978 marked the second anniversary of the first Seals 8K memory. And over the past two years Seals has delivered more than 20,000 8K memories.

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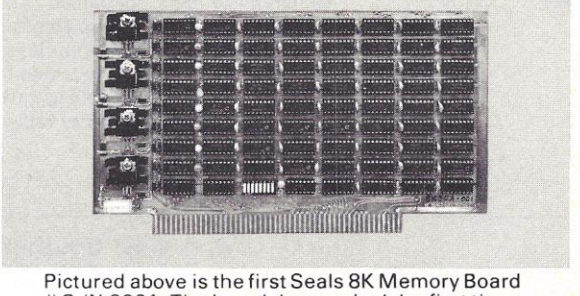
The Seals 8KSC pictured above is available in both slow (500 nsec.) and fast (250 nsec.) versions. There are also Seals 8K's for your 6800 computer--the Seals 68KSC and 68KSC-Z. All Seals memory boards come assembled and tested and include gold edge connectors, sockets for all ICs, all address, control and data out lines fully buffered, and many more important features.



Pictured above is the first Seals 8K Memory Board # S/N 0001. The board that worked the first time.

When the time comes for your computer to remember more, you'll want to remember Seals--the memory people. Seals product reliability is a standard in the industry--the standard your system deserves. For performance and dependability you can count on, ask your retailer for memories and accessories from Seals Electronics.

The board pictured below is the very first Seals 8K ever assembled--S/N 0001. If you are a Seals 8K owner, you won't be surprised to know that this board has seen long and demanding service and was still up and running in a TVA computer in Tennessee when it was removed to be photographed.

Since Seals products are distributed through retailers throughout the country, we at Seals really don't know where all the 8K's are or how they are being used. If you already own a Seals 8K, we would like to hear from you. Just drop a note to our Marketing Division at 10728 Dutchtown Road, Concord, TN. 37922.

If you would like information on the full Seals product line, and a list of retailers in your area, write to the same address or call (615) 966-8771.

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CIRCLE 8

The Mag-Ten Disk Drive by Computerware

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Representing an entirely new approach to cost/performance mass storage, the Disk is a truly innovative design yet it uses proven state-of-the-art large disk technologies to provide medium capacity removable disk storage.

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The removable disk is housed in its own cartridge, 11 inches square and less than one inch thick. Operators find this light (2.8 lb) flat cartridge easier to handle than the bulky, awkwardly-shaped older type cartridge. You can get nearly three times as many on a storage shelf compared with the 5440 types.

TRUE TABLE-TOP

In addition to the usual rack-mountable configuration, the removable disk drive can be supplied as a true table-top model weighing less than 40 pounds.

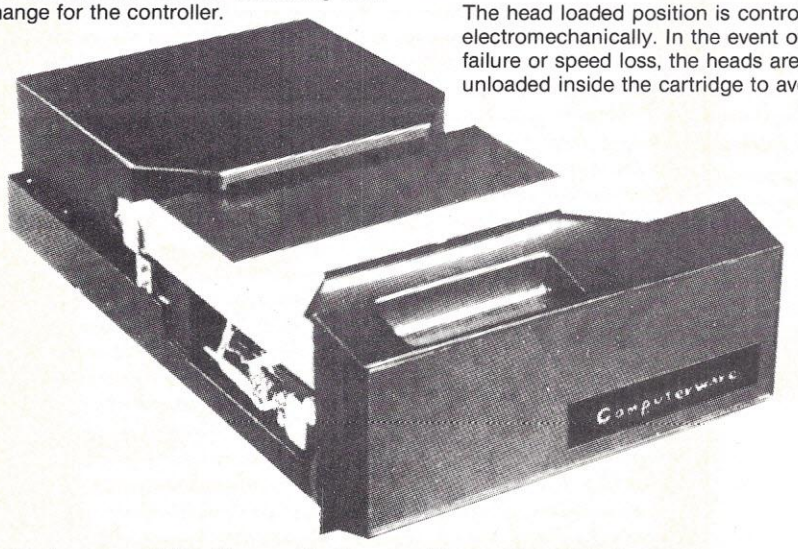
ADVANCED TECHNOLOGY

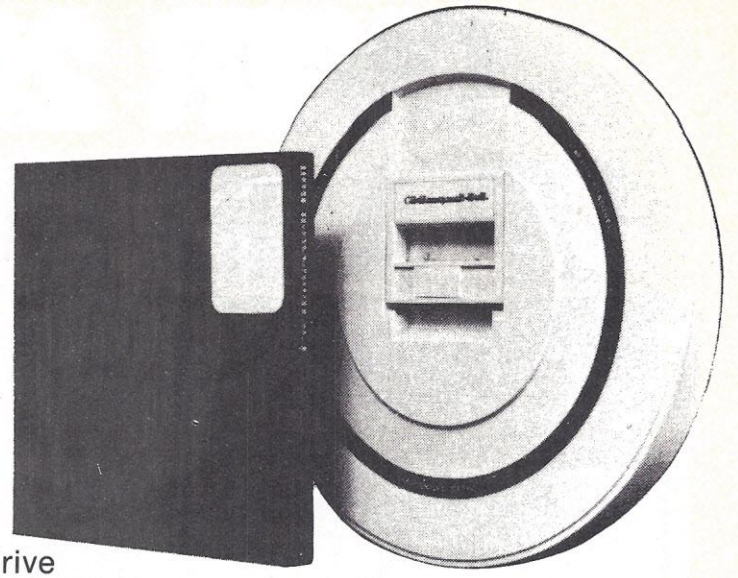
High Density Packing

Inside the cartridge is an industry-standard disk with a reduced diameter of 10.5 in.
All other characteristics of the media remain unchanged.
High density recording provides a capacity of 5 MB preformatted data per surface, 10 MB per disk.

Read/Write Circuits

Recording code is M.F.M. Read and write clock, V.F.O., and Data Recovery are integrated into the drive circuits facilitating data exchange for the controller.





Spindle Drive

The brushless DC motor and the spindle form a single integrated assembly: belts, pulleys etc, are eliminated. As a result disk speed control is more accurate, reliability improved, and maintenance simplified.

Servo Tracking

High data accuracy is achieved by using servo-tracking techniques where the head servoes on to the required data track.
Tracks contain pre-recorded servo data at the beginning of each sector.
This does away with the cylinder transducer and therefore complicated thermal compensation devices and the costly calibration disk required for head changing and maintenance.
Another major advantage of servo-tracking is to ensure full cartridge interchange compatibility between the drives.

Head Loading

The head loaded position is controlled electromechanically. In the event of power failure or speed loss, the heads are rapidly unloaded inside the cartridge to avoid damage.

Clean Air

The pressurized air-flow normally provided by a fan is generated by a combination of the high speed rotation of the disk (3600 RPM) and the specially designed internal geometry of the cartridge. All air circulation in the cartridge passes through an absolute replaceable filter which retains particles over 0.3 micron.

Very Low Power Consumption

The reduced size of the disk and consequent short head carriage displacement allows the use of a miniaturized voice coil actuator.
This results in the very low power consumption of 100 Watts.

MEDIA

Although the drive employs high bit packing density, it requires only standard grade 3336-type recording media. This is possible because media defects are dealt with at sector rather than track lever. Fifty spare sectors are provided on each surface, allowing at least that number of defect. In operation the drive signals to the controller the defective sectors identified during disk certification.

RELIABILITY

The concept is new yet the techniques used are now wellproven in high performance mass storage devices.
Construction has been simplified to employ a minimum of parts; scheduled maintenance is unnecessary; there are no electronic/mechanical adjustments to perform; head replacement is simple without recourse to a C.E. pack; mounting of the disk spindle directly on motor eliminates belt/pulley replacement and adjustment procedures.

For Price and Delivery Information, Contact:
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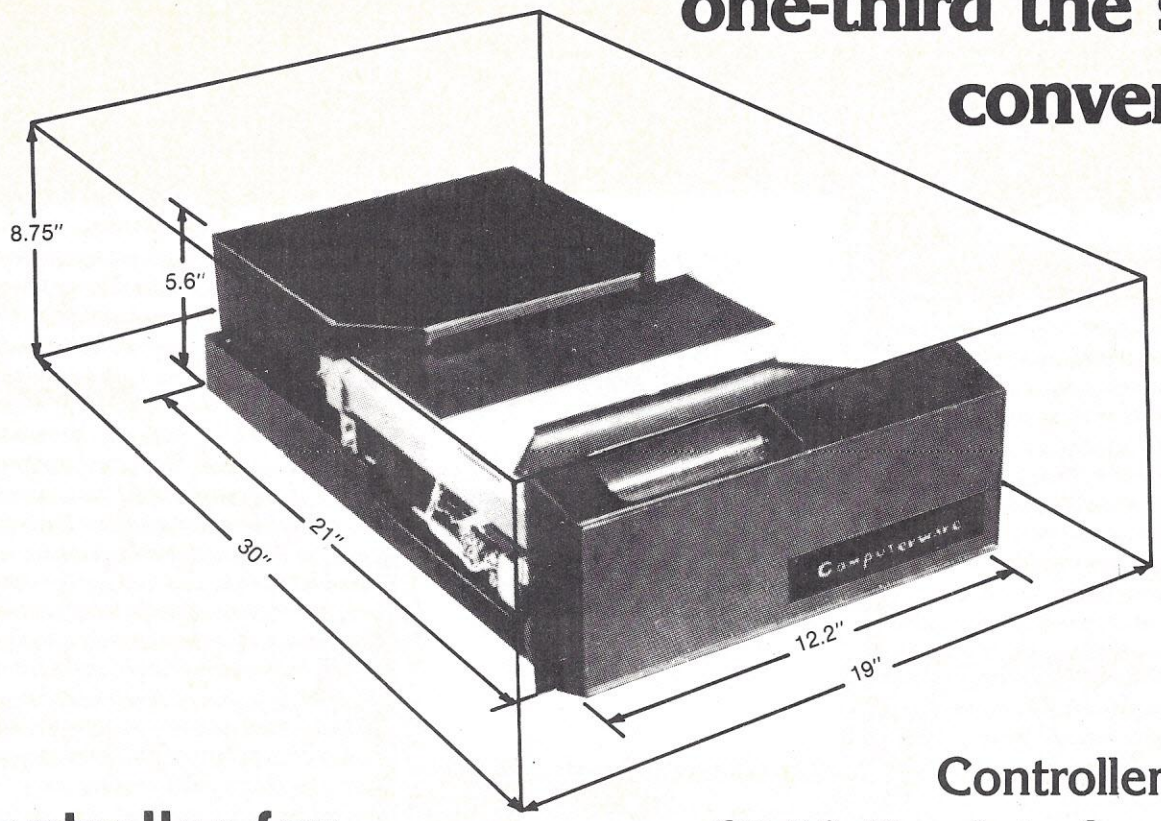
New disk drive packs 10 Megabytes in unit one-third the size of conventional drives.



Controller Card and S100 Bus Interface Available

Controller for Microcomputer Systems

Among the many applications of the D120, D140 mididisk drives one in particular is the disk drive used in association with a microprocessor-based microcomputer system.
The addition of a controller to a disk drive constitutes a disk subsystem which is easily connectible to a microprocessor-based user system using an 8 bit input/output architecture bus.
The ease of an interface connection is readily evident from various tasks managed by the controller, namely:

- address management
- sequential control of read/write operations
- asynchronous data transfer by user in buffered mode
- synchronous data transfer in real time
- buffered data memory with 4 sector capacity
- autonomous processing of defective sectors on media
- format processing

Main Features

The controller is designed to work in three different modes of operation—buffered—real time, internal halt—and real time, external halt.

Buffered Mode

From one to four consecutive sectros are stored in a memory buffer. Memory capacity is IK—i.e., 4 x 256 bytes. Data transfer is made in asynchronous mode. If, during a write operation, the drive signals a media defect on one of the addressed sectors, the controller ensures correct defective sector processing by using the spare sectors reserved for this purpose at the end of the track.

Real Time - internal halt

This second mode of operation requires no buffer. The user-system initiates a read or write operation for one to four consecutive sectors. The controller manages the entire operation and stops automatically as soon as the requested number of sectors has been processed.
Data transfer is synchronous, at a rate of 916 KBytes/Second with an 8 bit wide data path, (—parity bit) carried out in real time.
Defective sector management can be carried out in two ways. Firstly, if a defective sector is detected, data is written into the sector following.
Management is ensured by the controller. Alternatively, defective sectors may be handled by the user. In this case the controller stops at the faulty sector, dispatches a status flag over the interface to the user-system which can then process the defective sector by software; i.e., go to spare sector at the end of the track, or use another spare track reserved for this purpose, (generally, track 000).

Real Time - external halt

This mode of operation is also executed without the buffer memory. A read/write operation is initialized by the user-system for any number of sectors on the same track address. External halt is effected when the system signals to the controller an end of operation. In this way, it is possible to write one complete track, or, read a track several times. Data transfer and defective sector management are carried out in exactly the same way as in Real Time, internal halt—see above.
Note: The different modes of operation described above are selected during manufacture. One controller is required per disk drive.

CIRCLE 9

More Shell Sort

Dear Editors:

There is a serious problem with the Shell sort ("Relocatable Routines", *PC*, June 1978) when the number of numbers to be sorted is a power of 2. To appreciate the problem, you must understand how the sort works. Basically, the Shell sort divides the numbers to be sorted into subsets and sorts the numbers in each subset by the linear insertion sort. On each pass of the sort, the number of subsets decreases and the sort is complete when there is only one subset.

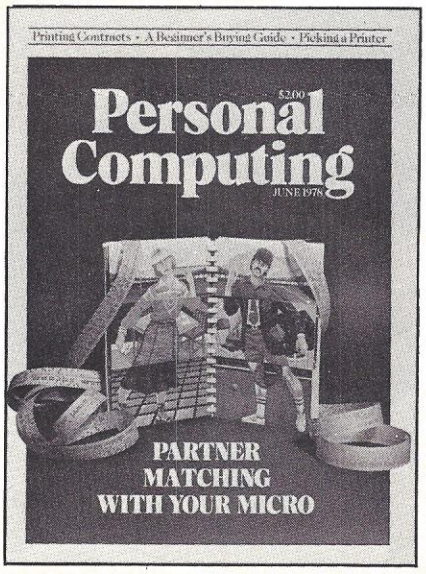
For example, for ten numbers, the subsets on pass one are (1,6), (2,7), (3,8), (4,9) and (5,10). On pass two, the subsets (1,3,5,7,9) and (2,4,6,8, 10) are each sorted and finally on the last pass all ten are sorted.

This procedure is efficient because successive passes operate on more and more ordered sequences. However, if the number of numbers to be sorted is a power of 2, the numbers in even and odd positions do not interact until the last pass. Thus the last pass has to operate on two sorted but interlaced sequences. The last pass will then take order N^2 operations to sort, where N is the number of numbers to be sorted.

For example, the numbers 8,1,7,2,6, 3,5,4 are sorted into the sequence 5,1, 6,2,7,3,8,4 after pass two and the final pass works on a not-so-sorted sequence.

Notwithstanding this problem, the Shell sort is a good sort. A shorter and to my mind clearer version of the algorithm in BASIC follows:

```
 10 J = N
 20 J = INT(J/2)
 30 IF J<1  THEN 160
 40 L1 = 0
 50 L2 = N - J
 60 L = L1 + 1
 70 IF L>L2 THEN 20
 80 L1 = L
 90 IF A(L)<=A(L + J) THEN 60
100 T = A(L)
110 A(L) = A(L + J)
120 A(L + J) = T
130 L = L - J
140 IF L>0 THEN 90
```




```
150 GOTO 60
160 — Next step in program
```

My version is 15 statements versus 20 statements in Irving's version. I removed the variables H and H1, since H = L + J and H1 = L1 + J, and have used the relation INT (INT (N/2) /2) = INT (N/4) to simplify statements 1440 to 1460 in Irving's code. Since BASIC programs spend most of their time in interpretation, this results in a program about 10% faster. (See Figure 1.) When sorting a thousand numbers this amounts to half a minute saved in my version in a total of five minutes. If the numbers are almost sorted the difference in time can be as large as 40%.

Marvin R. Lipford
Sherwood Park, Alberta, Canada

Author's note: The problem with lists of length 2^n is well known. What happens with such a list is that the Shell sort yields two separately ordered lists on the penultimate sort, which must be merged into the final ordered list on the last sort.

My list lengths typically run from 75 to 200. If a list happens to be exactly 128 ($=2^7$), I add one fallacious item to the list, which will end up outside the real sequence. For instance, I would add Mr. Z. Z. ZZZZZZZ to an alphabetic list and 9E99 to a number list. There are other techniques (e.g., Boothroyd/Shell and Hibbard/Shell) which partition at other than a fixed 1/2. As yet there is no study I am aware of that determines an overall most optimum partition technique by analytical methods.

You have gone to a great deal of trouble to show a marginal gain over the fundamental Shell sorting technique. I do not dispute your results — indeed, you have been so thorough that I could only replow ground that you have already pulverized! Most of the modern very fast sorting routines are "tree sorts" of one form or another. Woodrum's algorithm (to which I referred in the article) is one of these. I must admit I do not understand the theory of tree sorts as well as I do that of interchange sorts. What is clear to me is that most tree sorts require a linking list and have complex programs. Since writing the article, I've discovered a tree sort (called "Treesort", by Harold Lorin of IBM) that does not use a linking list. This makes it a somewhat less complex program, but less efficient. Several factors determine how efficient a sort will be (efficiency being the inverse of the time-to-sort, all other factors being equal). Among these are: length of list, mode of key (numeric or string), length of key, distribution of keys (range, clustering, redundancy), size of records and variability in size of records, plus the intended use of the output data. Most sort comparisons are based on random sequences, as was your comparison.

In *Sorting and Sort Systems* (pp. 167-173, Addison-Wesley, 1975), Harold Lorin compares several sort techniques. Using sample sizes of 100, 1000 and 5000, with data random, ordered, half ordered (1/2 increase, 1/2 decrease), interleaved and with duplicates, he exercises sort routines called: Singleton, Quickersort, Treesort, 2 versions of Shell sort differing in partitioning logic, a Stringsort and a Shuttlesort, Singleton is a compound sort using sifting for short partitions and Quickersort for long partitions — a very complex program. Quickersort is a tree sort with

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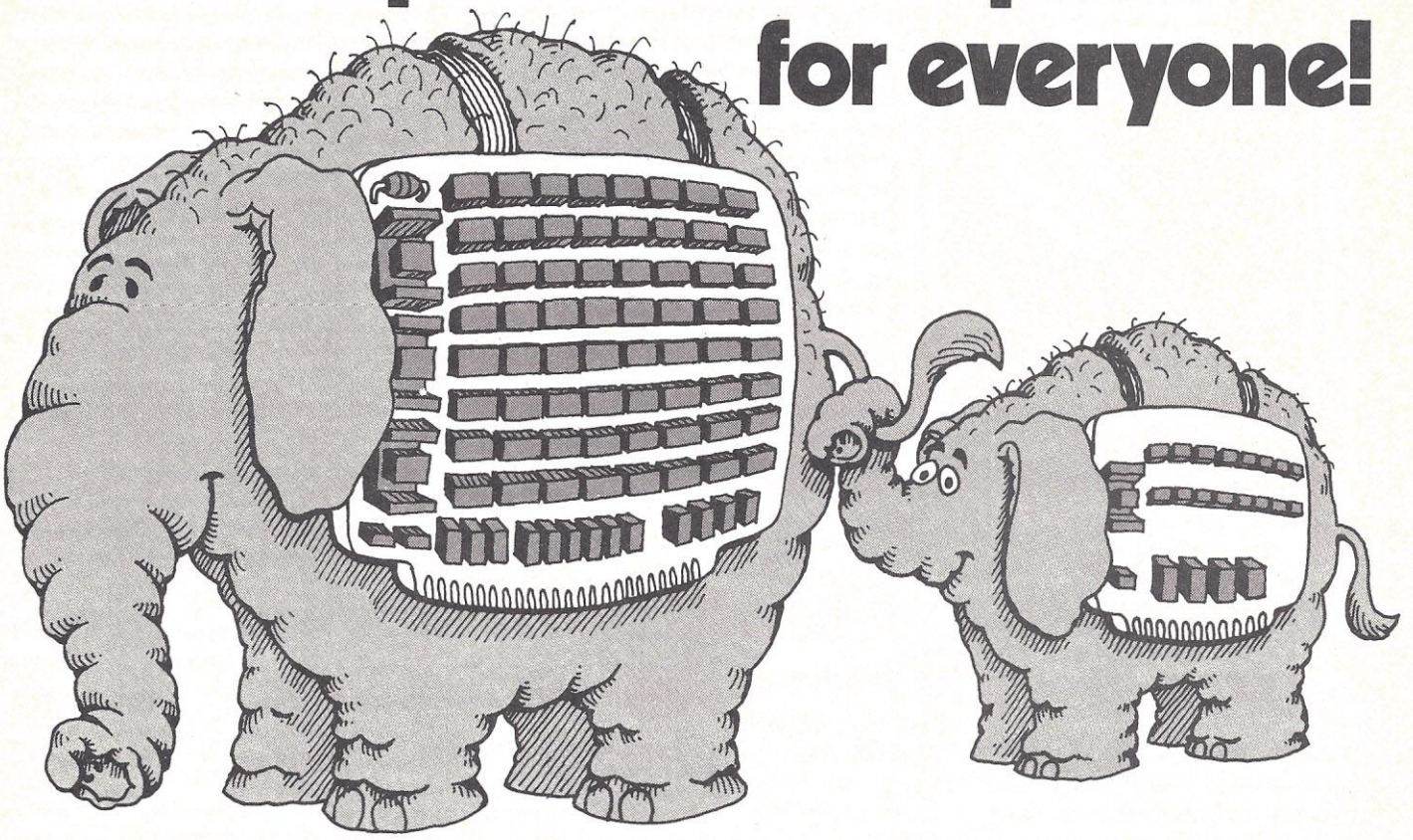

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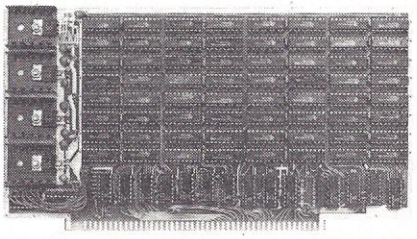

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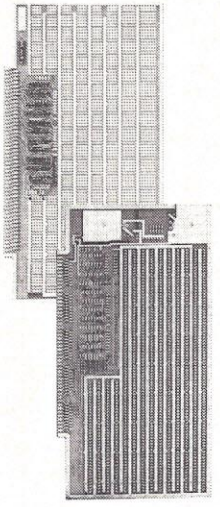

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CIRCLE 10

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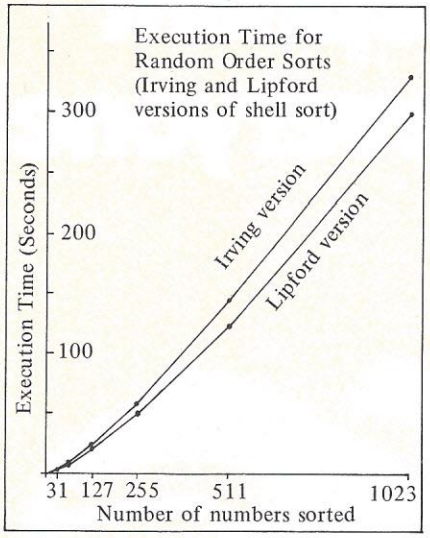


linking list and Treesort is link-list-less. Stringsort is a natural two-way merge and Shuttlesort is a version of sifting. As one would suspect, the tree sorts come out high on the list for efficiency (i.e., short sort times). The Shell sorts list as numbers 6,7; 11,12; 15,19; (in increasing list size sequence) in a total of 21 ratings. Thus for short lists (approx. 100) the Shell sort (your version *or* mine!) is quite efficient. Interestingly, the Treesort (unusual because of its lack of a linking list) ranks *behind* both Shell sorts for a list length of 100, but *ahead* of both for a list length of 1000. Hence, for short lists, the Shell sort is quite efficient and relatively short to program (again, either your version *or* mine). But all of the Shell sorts lose out to the various tree sorts when the list length becomes really long. Most personal computer operators will not reach this limit, however, since they will have run out of data memory first!

I appreciate the information on your more efficient version of the Shell sort and will put it in my library in lieu of the version I had previously used. But since there is only a small difference in the performance of the two routines, I don't intend to replace the old routine in completed programs unless they need to be rewritten for some other purpose. – *Robert Irving*

Computer Costs

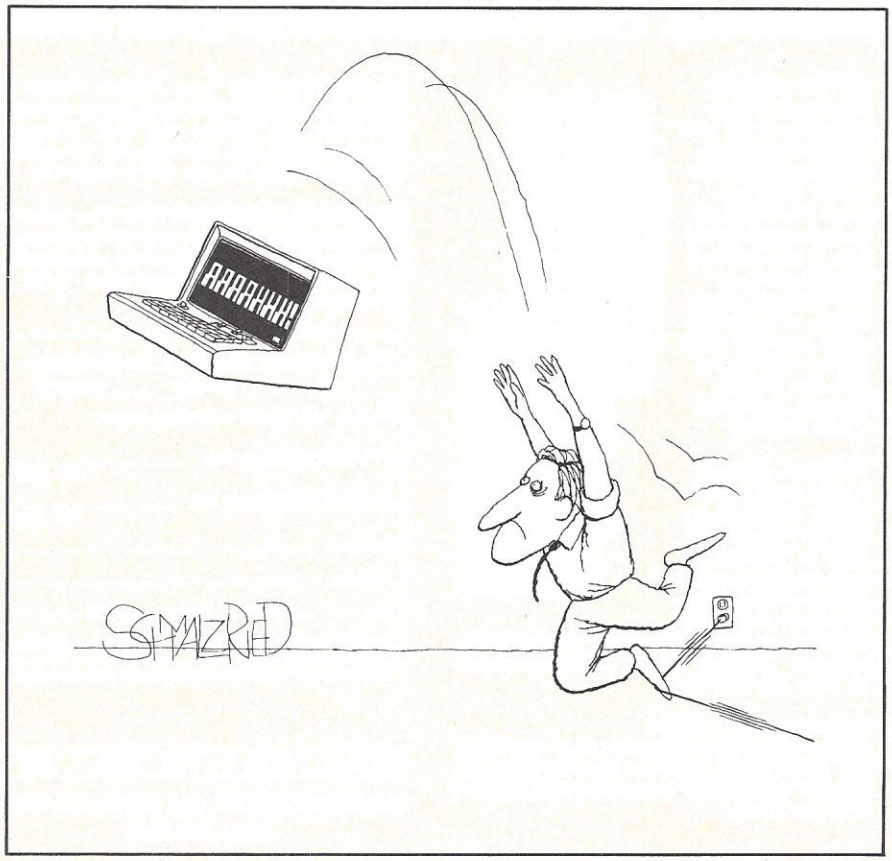
Dear Editor:

After having read many different magazines for quite a number of issues, I've sadly come to the conclusion that very very little is being done by magazine publishers in a much neglected area. The various magazines devoted to expanding the usage of microcomputers for the home and small business markets generally do a good job, but are missing an area that really needs help and when fulfilled would greatly increase the usage of microcomputers. Many thousands of people in the United States and abroad read these magazines even though they do not as yet own even the smallest microcomputer. Many read just because they are interested, but the majority, I feel read in the vain hope that somewhere they will find a method that will allow them to buy a system such as the ones they read about.

What I am trying to say is this: *"Why aren't you, the supposed passers of knowledge, helping to show others how to finance microcomputers?"* Oh, sure there are lots of "How to buy a Microcomputer" articles, but none of them give even the smallest idea of how to afford such large sums of money. The cost of $3500 to $7500 for a rather sophisticated system is so high that no one from the upper low to lower middle income groups can possibly afford such a system. The monthly payments for three or four years would be much too high to come out of the family budget and none of us have a savings account that contains that much money.

How then, can we afford such a system? (1) Steal the money needed – possible, but illegal. (2) Steal the computer – also possible, but also illegal. (3) Save the money from an already small budget – 1999 A.D. and still no computer. (4) Buy one small portion of the system and expand when possible – this is as bad as trying to save the needed money (Hello, 1999). (5) Buy a small system (very small) and just forget about the big one – practical but not worth much; a small system just won't handle the load. Why spend money for something that just won't do what you need? (6) Get a part time job and use this money – part time jobs don't pay much but this is better than trying to save the money from the budget. (7) Find some use that will allow the system to earn its own keep – good idea but it better work. I'd hate to try and make $250-a-month payments out of my budget if it fails.

And last but not least: (8) Forget



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CIRCLE 11

the whole idea! Just about the only thing left, but I don't really like it as it rates below theft.

Jeff Thomas
Beaver Falls, PA

Editors' note: You bring up a good point, Jeff. Although microcomputers are inexpensive compared to what equivalent computing power would have cost just a few years ago, they're still rather expensive for most budgets. And unfortunately, there's no simple way to raise that kind of money. (One of our editors sold his car and used the money to buy a computer.) Your letter covers the ways most people buy their computers. We offer two more suggestions: 1) Investigate used computers, both from stores and from individuals. Perhaps you can locate someone in your local computer club who's about to buy a new computer and will sell you his old one at a discount. 2) Use your computer in your regular business (as opposed to starting a special "Lemonade Computer" business). Time and money you save can let the computer pay for itself. And you can play *Star Trek* after hours.

Perhaps you've set your sights too high. Few of us actually own our "dream systems"; we have a constant itch for more memory, a better printer, another floppy drive. And most of the lucky ones who now have full-blown, 64K, multi-floppy systems with fancy printers started small and bought additional peripherals as they could afford them.

Personal Computing recently ran a story showing how to build a computer for just a few hundred dollars (see "Elf II: A Small Beginning", May 1978). Also, as we have reported in "Computer Chess", August 1978, Steve Stuart of Mountain View, CA, built a homebrew, "metal box" with 2650, 2K RAM and other parts for a total cost of $85. He programmed it to play chess, entered it in the San Jose Microcomputer Chess Tournament in March of '78 and wound up with one win, one draw and three losses playing against some $3500 machines. Small, sure. Incomplete, sure. But it's a beginning.

Buying a computer is basically no different from buying a car or fancy stereo. If you really want the item, you'll find a way to finance it. Good luck! – *D. W. & H. S.*

The Case of the Missing Lines

Dear Editors:

I started to enter Herbert Schildt's Stock Analysis program appearing in his article "Wall Street Wallop" in your May 1978 issue of *PC*. After a few hours of loading, I reached line 1260 in the Stock Access program listing and found there should be about 20 more lines of statements. These would include such items that appear in the program run that was shown, as, Standard Deviation, S2; Correlation, R; Volume Average, A2; and Yield Average, A4.

Edward M. Benford
Hawthorne, NY

Editor's note: Reader Benford is right. Actually, 28 lines of the Stock Access program were accidentally omitted. They are shown below, and follow line 1260 of the program. – *D. W.*

```
1270 !
1280 !TAB(15),"STANDARD DEVIATION-";S$, "   ",S1
1290 !
1300 !TAB(15),"CORRELATION:              ",R
1310 !
1320 !TAB(15),"VOLUME-AVERAGE:           ",A2
1330 !
1340 !TAB(15),"YIELD-AVERAGE:            %",A4
1350 !
1360 INPUT "M O R E ? ",Q$
1380 GOSUB 1410
1390 IF Q$="Y" THEN 1395 ELSE 1450
1395 IF K=1 THEN 100 ELSE 760
1400 !CHR$(27),"*"
1410 Q$=Q$(1,1)
1420 RETURN
1430 !"              E N T E R   P A R A M E T E R :  ",
1440 RETURN
1450 INPUT "D O N E   W I T H   S E A R C H : D O   I T   A G A I N ?",Q$
1460 GOSUB 1410
1470 IF Q$="Y" THEN 100 ELSE END
1500 GOSUB 1400
1510 !\!\!\!
1520 !TAB(15),"THROUGH-OUT USE YES, NO, GREATER THAN, LESS THAN"
1530 !
1540 !TAB(15),"---ALSO, D O   N O T   U S E   D O L L A R   S I G N S ---"
1550 !\  INPUT "TYPE 'YES' AND RETURN TO BEGIN",Q$
1560 RETURN
READY
```

Recursive Budgeting Bug

Dear Sir:

I have spent a great deal of time converting Gene Dial's recursive budgeting program (May/June '77) to North Star BASIC.

The author's comments in the November/December '77 issue not withstanding, there appears to be a very definite error in the allocation of variable expense. You may test this for yourself by running a total for the variable expense column on page 55. This figure is $198, which is $63 less than the amount in the Interim Summary table. The error is carried over into the final variable expense figures. The total for the period-variable expense on page 56 is $651 not $684, a difference of $33.

I tried Mr. Nesenjuk's (November/December '77) fix with no improvement noted. I would be interested in Mr. Dial's explanation of the discrepancies in the totals I've pointed out.

If anyone has a fix for this problem I would like to hear about it.

James Tate
Lubbock, TX

Author's Note: The Recursive Budgeting Program is being totally revised for inclusion as a program in CRAS (Check Register Accounting System). The first installment of the CRAS system appeared in the August issue of *PC*, and the second installment appears this month.

Tying recursive budgeting to the system makes possible monthly reports comparing the budgeted amounts in each account to what was actually spent (or received), thus giving the program considerably more value than the previously published version.

– *O.E. Dial*

CIRCLE 12 ▶

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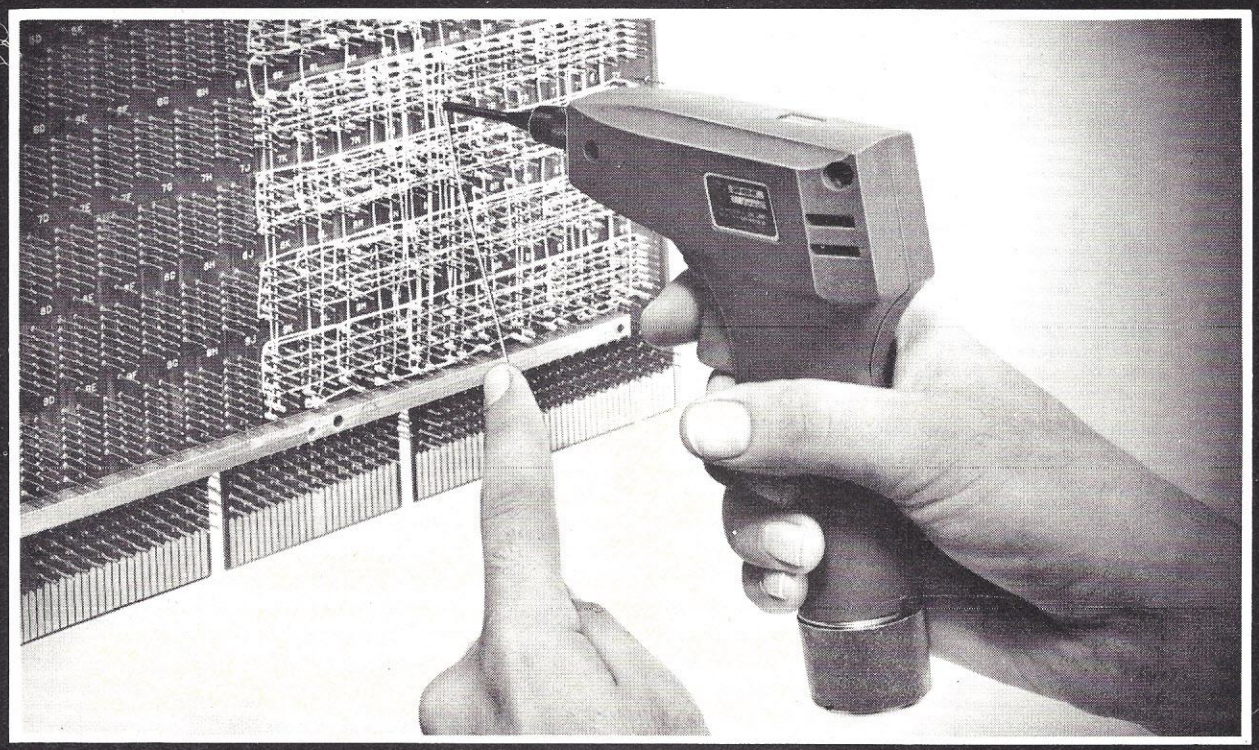

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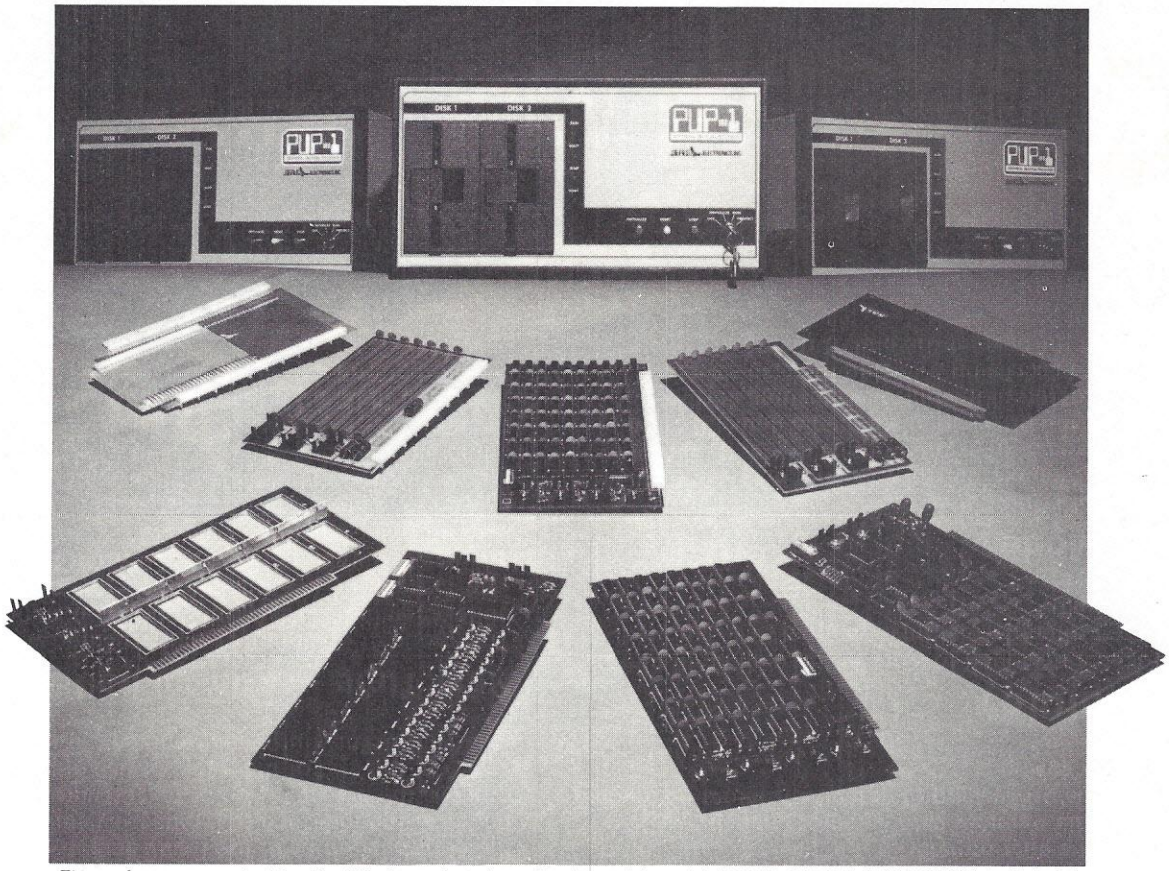

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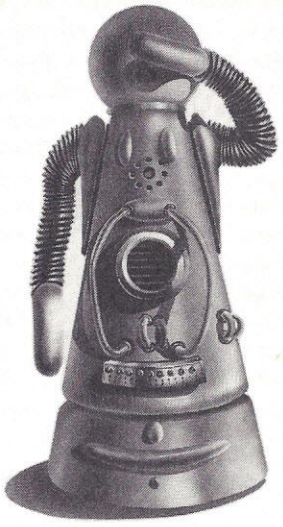
CIRCLE 13

RANDOM ACCESS

Who Was That Robot You Were Out With Last Night?

If you attended the Small Business Exposition in Boston, as I did one day this past June, and talked directly to a robot, it wouldn't be funny. Robots, according to the company that rents them out, are destined to

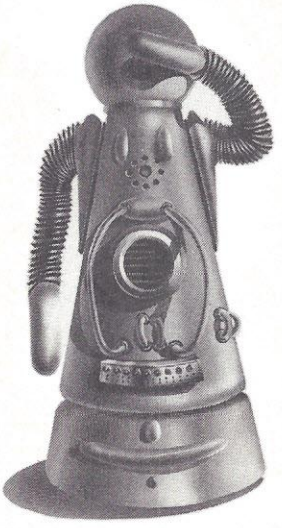


take over the world and replace humanity. I have nothing against robots — I think they're okay as far as they go. Personally, I believe they would make lousy people. They're too serious — too business-like. They would never think of taking ten minutes off and sneaking down to Charley's Bar and Grill for a fast boilermaker (shot of whiskey with beer for a chaser).

If I have one emotion towards these tin cans I suppose it is one of pity. I feel sorry for them. If one happened to creak its way onto a crowded subway car during rush hour I would stand up and offer it my seat, even though the model I saw is in a permanent stand-up position.

Furthermore, I have a subjective philosophy (philosophy you think up yourself) about robots. My subjective philosophy about robots is that, sure, they may inherit the earth some day when we're all gone, the way we inherited it from the salamanders. But what fun are *they* gonna have? With a world full of clumsy, sealed, sardine-cans with no sardines inside what good are they to themselves? What would be their purpose — to live forever? Big deal! The Rocky Mountains will live forever but who cares?

Anyway, when I heard that a robot had come to town I decided to go down and have a chat with it. The business exposition was taking place at Commercial Pier on Boston's Waterfront and it was nice to get away from the

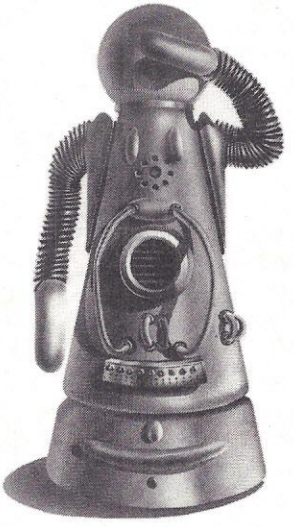


city's automobile exhausts and go there to get a whiff of the fresh salt air, if for no other reason. The robot had been hired to attract visitors to the show, the way fly paper attracts curious insects. The robot is a good example of how you make computers work for *you.* Just stick 'em into something that will go "whirrr!" Then sit back and count the money that rolls in. Each robot has inside its guts one of these computers which, when properly programmed, causes the robot to perform the task assigned it. The only limit on what the robot will do is linked to the limit of the program you enter into the computer. Programs, of course, are limited in their size by the size of memory in the computer.

"Hello," I said to the dumb-looking contraption that resembled a cone-shaped, silver-colored New Year's hat. It was rolling noisily across the floor offering gear-controlled, jerky handshakes to anyone brave enough to respond. The machine stopped when it reached my vicinity, lights flickering through its translucent cone-tipped dome. It came to a halt a foot or two away, its featureless face staring vacantly at me, I suppose. Attached to its body was a sign which read, "Hello, I am Klatu. What's your handle?"

"Are you the real Klatu? I asked starting the conversation and pronouncing the name with a soft "a" like in "bar". Harvard had left the impression on me.

A guide, Johnny Chewminj,



standing nearby whispered into my ear. "His name is Klatu!" he said using the "a" of "day".

"How did it ever get such a name?" Klatu waited impatiently, its lights flickering nervously.

"That was the idea of our pres-

Illustrations by David Gardner

ident, Tony Reichelt, who reversed the command 'You Talk' using the letter 'u' for 'y-o-u'."

Klatu, I learned from guide Johnny, is one of a family of 30 such robots, produced by Quasar Industries of 59 Meadow Road, Rutherford, NJ.

I looked at the sign again. "Sorry. Are you Klatu?"

"Yah!" said the robot, its monotone voice emerging from somewhere around its navel. "I'm Klatu!" It sounded as though it had caught a cold in its nose, which was a surprising sound because Klatu had no nose.

"Say something intelligent, Klatu?" I said. Frankly, I have no idea of how to converse with robots just as I have no idea of how to talk to sparrows although I carry on long conversations with them.

"Sure. Whaddya want me to say?"

"What do you think of life on this planet?"

"My name is Klatu."

"How old are you?" Profound questions obviously, were not handled easily by robots.

"How old are *you*?" Klatu threw the question right back into my face.

"I'm two years old," I said capriciously. "How old are you?"

"How old are you?" repeated Klatu again. Evidently it was stuck in a program sub-routine and couldn't get out.

"Say something else," I said.

"You've got an electric camera in your hands," said Klatu. "Can I take it out for a date tonight?"

"Do you have any brothers or sisters, Klatu?"

"My name is Klatu. Your camera looks really loaded, wow!"

"Do you have a mother or father?"

"Well developed, too."

"You're not answering the questions, Klatu!"

"My name is Klatu. I bet she's all wound up!"

"Snap out of it," barked Johnny to Klatu in a stern voice. "Sometime he goes off on his own program tree search," he said to me, "and we can't get him back."

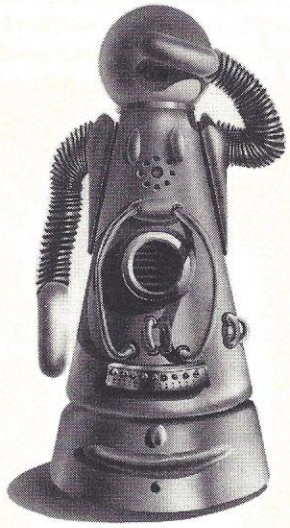
The words "Snap out" must have been a recognition code because Klatu lapsed into a stony silence refusing to utter even a faint sigh. After a few minutes of this, I rapped sharply on the robot's tin housing. It was like rapping on a tomato juice can. "Klatu? You still in there?"

"Yes are you still there?"

"Yes. Okay Klatu. Tell me something about your sex life?"

"Are you still there? I thought I wasn't supposed to start for another half hour."

Johnny the guide explained that Klatu worked by its own clock and had been programmed to begin functioning in about half an hour when the mayor of Boston was scheduled to arrive.



Starting before the scheduled time was upsetting him.

"How does he know when to start?" I asked.

"We told him that through the program," replied Johnny. "We tell him everything. He's very curious. Wants to know what's going on all the time."

Klatu, one of a family of 30 different robots, is produced and marketed by Quasar Industries of Rutherford, NJ. Other robots in the series are called "Sentry Patrol Robots," "Sales Promotional Androids," "Automatons," and "Para-Medic Robots." Klatu, when not programmed to function at trade shows, works as a "Domestic Android." Quasar claims its robots are capable of performing complex duties such as tracking down building intruders, immobilizing adversaries, speech recognition of five different people, serving dinners, and performing a multitude of other tasks that one normally might find mentioned only in science fiction. Whether or not Quasar's robots actually perform their tasks without remote control and guidance is difficult to determine as the company does not divulge information on "how it does it". Identifying people through speech recognition by one of its Sentry Robots is a highly advanced form of computer research. One can't help but wonder how Quasar accomplishes this task through microcomputers. At the present, the leading researcher in voice recognition on big computers is Dr. Arthur Samuel of Stanford University who has given up computer-checkers to study the problems of voice recognition. This subject, claims Dr. Samuel, offers a far more difficult challenge in artificial intelligence than does a checker game. In the light of Dr. Samuel's advanced research on giant IBMs one must look with great curiosity, at Quasar's claims that this complicated tree search is performed in its rather simplified micro-programmed robots.

— Harry Shershow

Illustration by David Gardner

Industry Report

Personal Computing Industry Report, a new monthly newsletter, provides news, market analysis, product reviews, company profiles, technology forecasts and applications case studies. Five major applications areas — business, professional, education, hobby and home — are included. Each edition of the newsletter contains analysis and comment on hardware, software, peripherals, microprocessors, memory, retail stores, trade shows, technical conferences and other areas.

Additional information on PCIR can be obtained from Vantage Research, 770 Welch Road, Palo Alto, CA, 94304.

Minority Computing

Minority contractors throughout the United States are taking advantage of a small computer to help them hold down costs and stay on schedule.

The IBM System/32 computer gives small minority-owned contracting firms a management system that had been available only to very large businesses, said Dickie S. Carter, President/Executive Director, Minority Contractors Assistance Project, Inc. (MCAP).

MCAP is a private, non-profit, Washington-based corporation which provides financial and technical assistance to minority contractors in a number of U.S. cities.

Said Carter, "We're not reformers. What we are doing with the computer is helping minorities become more competitive through better management. And they are doing things with this system to control construction costs that are as sophisticated as anything in the industry today."

According to Carter, a contractor in cities such as Atlanta or Los Angeles can tie into MCAP's computer in Washington, DC, from an office trailer at a job site. The contractor transmits information including estimates, budgets, production schedules and progress reports to the Washington office through terminals and telecopiers.

The information is received in DC and entered into the system, which is programmed to monitor, update, compare and analyze each line item of work in a construction project. Within an hour the contractor has a computer-produced report completely analyzing the job's progress. The report also indicates any problem areas so the contractor can take immediate corrective action.

"The system not only helps the minority contractor perform as well or better than the larger firms, but helps him get the job," said Carter. "The system provides the contractor with information that helps him obtain bonding and working capital. When the contractor presents a bank or bonding agent with a complete computer-generated cash flow analysis, he makes a very favorable impression. He may then display a computer construction schedule using the critical path method and offer to update both reports as the job progresses. This frequently produces the bonding or working capital he needs.

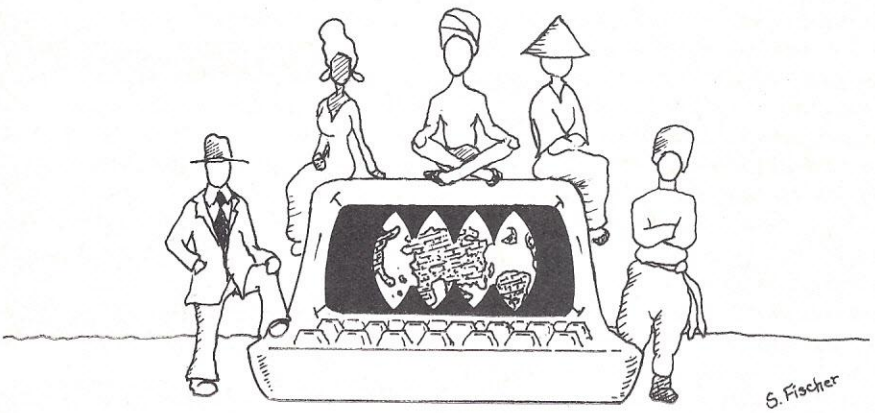
"Our overall objective is to get the minority contractor so well managed and organized that he doesn't need us," Carter added.

Since it was founded in 1970, the organization has worked with nearly 2000 minority contractors ranging from one-man operations to those with over 60 employees.

Computer aids anthropology students

Anthropology students at Stanford University now have a computer helping them learn population growth and demography principles as well as teaching them programming.

Anthropology, once a qualitative study, found an increasing need for data processing — particularly in statistical studies, such as demography. These studies often entail collecting huge quantities of data. An ongoing demographic study at Stanford of Taiwanese families covers 50 years and tens of thousands of subjects, analyzes trends in Taiwanese marriage patterns, fertility and mortality rates, family size, land holdings and so forth. This kind of work is nearly impossible to do manually.



The Anthropology Department at Stanford had long used the University's main computer facilities, particularly for large scale problems. However, the faculty began to realize that a small in-house system dedicated solely to the department was needed.

After investigating a number of different models, the department bought a Hewlett-Packard 9800 System 45 desktop computer. Included in the purchase was an HP 9871A Impact Printer and an HP 9872A four-color plotter. Both are used for producing camera-ready manuscripts and charts for publication.

Faculty members say the machine is very popular on campus, particularly for people learning to program. Computer time has to be scheduled in advance.

The faculty uses the computer for text editing also. Technical papers are composed and edited on the computer, using graphics software to produce bar graphs and other illustrations. Error correction is easy — the system prints syntactical errors almost instantly. The graphics option produces illustrations more accurately and at least 10 times faster than by hand.

Future plans include the acquisition of an HP 9885 Flexible Disk to enlarge the system's data base capacity and enhance its text processing speed.

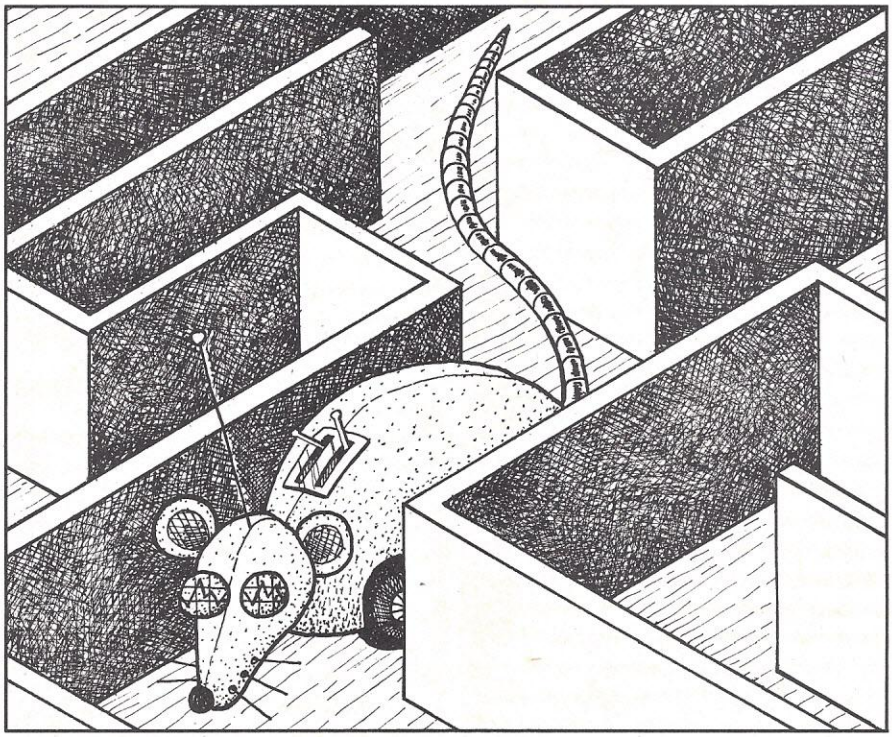
Mighty Micro Mouse

Engineers worldwide have been busy developing electronic mice to enter in the "Amazing Micro Mouse Maze Contest" sponsored by Spectrum Magazine and Computer Magazine. Approximately 6000 entries have been received.

The electronic mice are programmed to run through a secret maze which is changed for each regional competition. Specifications include no "umbilical cord" and no remote control. The mouse can be propelled by batteries, electric motors or mechanical springs, and may use microcomputers for intelligence. Although the mouse does not have to look like a real mouse, it can not fly, jump or climb over maze walls and must literally negotiate the maze.

The first trial run took place at the National Computer Conference's Personal Computing Section in Anaheim, California, June 6 to 8. Because of technical difficulties, only six official mice entered out of 54 originally scheduled. One contestant's mouse made it through the maze in 51.4 seconds; another did it in 4 minutes and 32.48 seconds.

Competitions are tentatively planned for major electronic trade conventions around the country this year and next. The final competition will take place in June 1979 at the National Computer Conference in New York City.



Building better circuits for tomorrow

Recent results from several laboratories show increased promise for the development of ultra-high performance logic and memory circuits for computers, according to June *Physics Today.* Aside from the very fast switching speeds of these new circuits, the amount of heat they generate is typically thousands of times less than in high-speed semiconductor circuits. Consequently, the new circuits can be packed closer together, further improving computer speed by decreasing the time for an electrical signal to travel from one circuit to another.

Groups working at IBM in Yorktown Heights, NY, and in Zurich, and at Bell Laboratories in Murray Hill, NJ, recently announced results of their research on these circuits, which employ Josephson junctions instead of semiconductors. A Josephson junction consists of two superconductors separated by a thin insulating layer. It operates, as do all superconductors, at temperatures close to absolute zero (-273°C).

Named after Brian Josephson, the British physicist who won the Nobel prize in 1973 for predicting the effect upon which the operation of these circuits is based, Josephson junctions have found other applications in extremely sensitive devices for physical measurement of, for example, magnetic fields.

Other groups working on Josephson-junction computer elements are at Texas Instruments, Sperry Research Center, Aerospace Corporation, Hughes Research Laboratories, the National Bureau of Standards, the University of California at Berkely, Fujitsu Laboratories in Kawasaki, Japan, and Nippon Telegraph and Telephone in Musashino, Japan.

PLATO teaches illiterate adults

The 23 million American adults who are functionally illiterate now have an opportunity to catch up quickly, according to initial test results of a nationwide study conducted by Control Data Corporation.

At one of the eight locations where students were given the Basic Skills Learning System developed by Control Data Education Company, adults gained, on the average, one school year in reading in less than 12 hours — 7½ hours on the PLATO computer-based education system, plus 3¾ hours of outside study. Adults jumped 1½ grade levels in math in less than 20 hours — 13 on the PLATO system and 6½

Illustration by Susan Howard

hours in outside study.

Dr. Peter J. Rizza, Jr., Control Data's educational consultant who developed the Basic Skills Learning System, termed the test results "the first good news about education for that population in a decade." Dr. Rizza said, "The early results also reveal that students are extremely motivated when using Control Data's Basic Skills Learning System delivered on PLATO. The dropout rate in other remedial programs for functionally illiterate adults reaches as high as 50 percent. The dropout rate for our program is less than 5 percent.

"These test results are particularly significant since they very well may be the first time some of these adults have ever succeeded in anything. So what the results really show is that basic skills taught by PLATO may be successful where no other programs have been," Dr. Rizza added.

The Basic Skills Learning System is intended primarily for young adults, ages 16 to 24, who are functionally illiterate, which HEW defines as a proficiency level lower than eighth grade. The program includes math, reading and language skills for grade levels 4 to 8. Up to 75 percent of the Basic Skills Learning System is presented on Control Data PLATO, a computer-based education system. Under development since January 1977, the Basic Skills Learning System will be made available for schools, adult education centers and correctional facilities.

Also under development by Control Data is a curriculum program designed for students who have completed the Basic Skills Learning System and are seeking a G.E.D. (General Educational Development) certificate, the equivalent of a high school diploma.

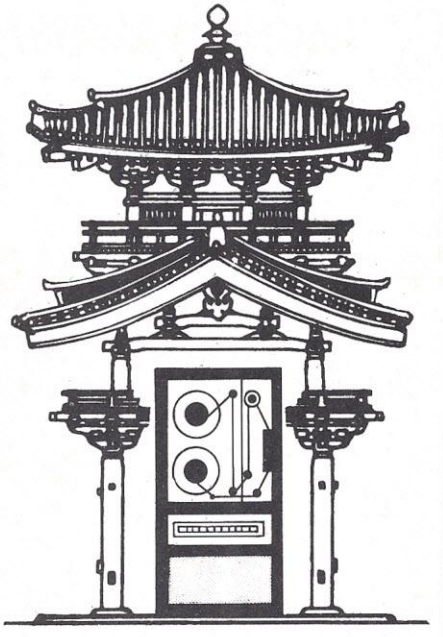
The PLATO system provides self-paced, individual instruction for a broad range of education and training needs. It can display lesson materials on a terminal screen in the form of animated graphics, drawings or text. PLATO immediately responds to students, who can communicate with the system through a keyboard or by pressing a fingertip on the terminal screen, according to Control Data.

Through these two methods of communication, students answer questions, make choices, change the displayed information or ask for help. In 0.2 seconds, PLATO flashes a response: "Fantastic, you got it," or "That's not right, look at the help sequence," or whatever comment the lesson author has designated.

Japanese Mini/Micro Show

On the heels of recent Japanese forecasts for increased production of electronics and mini/microcomputer equipment comes the announcement of a timely exhibition in Japan — International Microcomputers/Minicomputers Microprocessors '79/Japan (IMMM '79 Japan), January 24-27, 1979, at Tokyo's Harumi Exhibition Center.

Lower tariffs effective since last March on computer, component and accessory imports make the Japanese market attractive to U.S. and overseas producers. And now, with the organization of IMMM '79 Japan in January, international suppliers have a marketing vehicle to the Far East, a region where mini/microcomputer demand is expected to surpass that of the U.S. by 1985.



The European IMMM show has been a success for two years running. Visitors from 38 countries attended the 1977 exhibition in Geneva, Switzerland.

Like its counterpart in Europe, IMMM '79/Japan is expected to attract a qualified audience from a wide range of companies which incorporate mini/microcomputer, microprocessor, peripherals and components into OEM machinery and equipment for many industries.

And as a bonus, a sizeable contingent of electronics engineers, designers and manufacturing specialists is expected to attend since the inaugural IMMM show will be held concurrently with Japan's electronics packaging and production show — Internepcon Japan/Semiconductor. Each event will have separate exhibition facilities at Harumi, but the more than 25,000 Internepcon Japan visitors will have complimentary attendance privileges to IMMM '79/Japan.

For further details, contact ISCM, 222 W. Adams St., Chicago, IL 60606 USA; (312) 263-4866, Telex: 256148.

Pet Cassette Club

PET owners needing software can join a new club offering a monthly cassette containing a magazine, TV text, applications, hardware articles, peripheral reviews, programming hints, games and household and business programs.

The $27-a-year membership fee includes both the monthly cassette magazine as well as occassional hard-copy bulletins.

If you're interested in joining, send a check or money order to Program, P.O. Box 461, Philipsburg, PA 16866.

Illustration by Steven Fischer

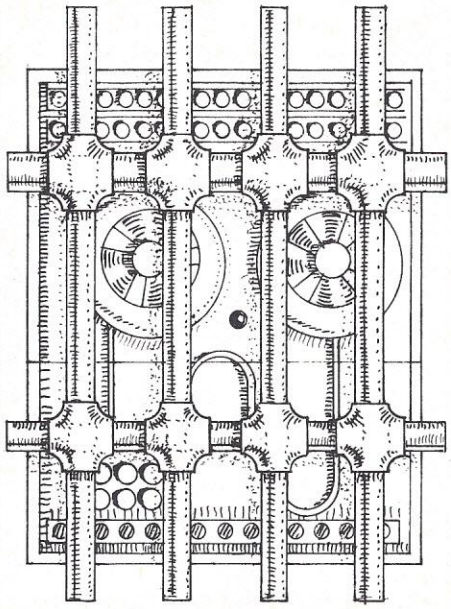
Computer crime a Federal case?

Proposed legislation could make computer crime a Federal case, punishable by up to 15 years in prison and a $50,000 fine.

According to Donn B. Parker, senior information management consultant at SRI International in Menlo Park, CA, "We have no comprehensive statistics on white collar crime, but we know its nature is changing as a result of the proliferation of computers. It is common practice for programmers, computer operators and others to make unauthorized use of computers for such activities as game playing, printing Snoopy calendars, calculating bowling scores and maintaining church mailing lists."

Many programmers believe the author of a computer program has rights to trade, give away or make personal use of the program even though his employer's resources were used in its development. Further, many computer technologists believe they are members of a technological elite with special rights to use and compromise any computer system, Parker said.

The proposed legislation would force organizations to specify to their data processing employees



exactly what activities are authorized.

The legislation would also cover unauthorized use of many programmable pocket calculators or digital watches and clocks. Parker said that while computer security has improved, it does not protect against the few highly skilled people who have sufficient knowledge to compromise systems. "Safe in their realization that they cannot be prevented or detected if they are careful enough, these technologists can do anything they please in sensitive business systems," he said. Parker described computer crime perpetrators as young (18 to 30 years old), highly motivated, intelligent and personable, making them among the most desirable employees. The proposed legislation covers theft, extortion, sabotage, vandalism and burglary as well as fraud.

Parker predicted future computer abuses will include massive fraud, organized crime activity, physical and mental harm to people, violation of personal and corporate privacy, tapping of data communications, violation of intellectual property, terrorism attacks and computer output hoaxes.

Parker supports this omnibus computer crime bill but feels it must be significantly changed to assure the technical soundness and adequate coverage of computer-related criminal activities.

TRS-80 users groups

The growing popularity of the TRS-80 microcomputer from Radio Shack has spawned users groups across the country.

Hugh Matthias, supervisor of Radio Shack Computer Services/ Customer Service, answers users' queries about the TRS-80. If you have any questions or problems concerning your Radio Shack computer, contact him at Radio Shack Computer Services, P.O. Box 185, Ft. Worth, TX 76101; (817) 390-3583.

Hugh recently sent us the following list of TRS-80 users groups. (If you know of other users groups, drop Hugh a line so he can update his list.)

Allen Bianco, P.O. Box 10-385, South Station, Anchorage, AK 99511; (907) 344-7388; 40 active members.

Tom Mueller, 1850 East Maryland 27, Phoenix, AZ 85016; (602) 959-5220; 50 active members.

Sonoma County Computer Club, Liza Loop, P.O. Box 945, Cotati, CA 94928; (707) 795-0405; 30 active members.

Inland Computer Society, Sandy Sparks, 3359 Second Street, Riverside, CA 92501; (714)784-3499; (714) 256-5319; 50 active members.

Pomona Computer Society, Al Sutton, 4155 Oak Hollow Rd., Claremont, CA 91711; (714) 593-6635; 50 active members.

John Snyder, 712-C Country Wood, Walnut Creek, CA 94598; (415) 938-9669; 63 active members.

Wendell Rice, 8909 Wenoga, Leawood, KY 66206; (913) 649-7105; (913) 384-1150 (W); 40 active members.

Dick Miller, 61 Lake Shore Rd., Natick, MA 01760; (617) 653-6136; 30 active members.

R. Gordon Lloyd, 7554 Southgate Rd., Fayetteville, NC 28304; (919) 867-5822; 126 active members.

Amateur Computer Group, 1776 Raritan Rd., Scotch Plains, NJ 07076; 800 active members, 20 with TRS-80s.

Allen Emert, Rt. 4, Box 1455, Odessa, Tx 79763; 15 active members.

C.W. Brown, 2048 Surrey Lane, Roanoke, VA 24012; (703) 344-8811 ext. 346; 100 active members.

Allen Barker, P.O. Box 7011, Tacoma, WA 90407; (206) 457-5666; 80 active members.

Chip Parrot, 8397 Leesburg Pike, Vieana, VA 22180; (703) 893-3767; 300 active members.

Robert L. Knudson, 336 E. North Academy Ave., Colorado City, AZ 86021; (602) 875-2202; just starting.

Illustration by David Gardner

Tellie Phones

Tellie, a computer-controlled hands-free automatic telephone, now enables a person to make and receive phone calls by simply speaking the desired numbers.

Developed by International Communications Management in San Francisco, Tellie uses the Mike voice recognition system manufactured by Centigram, Inc., of Sunnyvale, CA, to accept up to 16 spoken English or foreign language words, to answer and hang up the telephone and to dial frequently called numbers.

"Tellie promises to be the forerunner of a whole new generation of intelligent telephones of the 1980s," predicts inventor Terry Easton. "By the end of the next

decade, every telephone set will have its own built-in computer and be able to talk back to the user as well. Such telephones will automatically set up conference calls, keep retrying busy numbers and even locate desired persons — all under control of the spoken command."

An immediate application involves handicapped people who have no easy way to use the telephone. Tellie can restore a measure of normal life for them.

For further information contact International Communications Management, Inc., Suite 428, 680 Beach Street, San Francisco, CA 94109, or call (415) 441-4100.

Your own computer

Your Own Computer by Mitchell Waite and Michael Pardee © 1977 by Howard W. Sams, Inc., Indianapolis, IN 46268)

If there is available any single *"first book on computers"* this is surely it. Titled *Your Own Computer* and written by Mitchell Waite and Michael Pardee, this brief, easy-to-read primer (78 pages) tells it all simply, quickly and to the point. No foolin' around with Boolean algebra or impulse generator. It doesn't even bog you down with lengthy dissertations on octal or hexadecimal systems.

Contained within the book's pages are straightforward discussions on how computers work, how they are screwed together, how you can make them do your work for you, and even how you can send them out to work so that they can earn a few bucks for you.

Scattered among the many photos, illustrations and diagrams is a little history of computers. At $1.95 it's a nice, inexpensive book to add to the library. It will help explain things to the kids or the wife when they get curious about what you're doing in the corner with that gadget.

All in all, it explains in a few hours' reading time a complex subject in a brief and interesting style. "Everyone knows you can't get something for nothing," proclaims the book. "Well, an average high school student can start a business and have the computer pay for itself." If you want more info on such an enterprise, get the book. — *Harry Shershow*

Poly-Hyphen-Disk Users Group

Information and software for Poly/Micropolis, Poly/North Star, Poly/Vista or other combination disk systems is now available through the Poly-Hyphen-Disk Users' Group (PhD. UG).

PhD. UG's fee is $5.00 for ten newsletters (one year). Included in the newsletter is information on the PhD. UG software exchange programs available, needed or being developed. Each newsletter has a review of a disk system and an explanation of how to hook it up to your Poly. In addition, depending on space, members' questions about their systems' bugs will be answered. There will be a minimal charge for copying software for members (no more than $3.00 per program) plus cost of a diskette if not provided.

If you're interested in PhD. UG, drop your name, address, system you're running, membership fee and any comments/criticisms in an envelope to: PhD. UG, c/o Thom Hogan, 719 Anna Lee Lane, Bloomington, IN 47401.

On Wisconsin

A non-profit users' group for MITS mini-floppy disk system owners has been organized in Wisconsin. The group plans to act as a clearing house for software for the new mini-floppy.

For more information send a self-addressed stamped envelope to AAA Computer Services, P.O. Box 2742, Appleton, WI 54911.

Computerland in Europe

ComputerLand Corporation, a nationwide franchisor of retail computer stores, recently announced the incorporation of ComputerLand of Europe to be headquartered in Luxembourg.

ComputerLand's president Ed Faber looks forward to ComputerLand growing in Europe with success similar to that in the United States. It is estimated that ten stores will open within a year. The first ComputerLand store outside the United States opened last January in Sydney, Australia.

Techno Turkey and the Haunted House

BY LLOYD R. PRENTICE

"There was neither moon nor stars," said Techno Turkey. "The sky was black with clouds. We shuddered in our coats and pulled them tightly around us as the wind howled and the thunder rumbled. Up on the hill we could see the house – the looming house – silhouetted against the horizon as lightning crackled across the sky."

Not bad, thought Turkey with a smirk as he looked down at the rapt little faces riveted up at him.

"And then what happened, Uncle Turkey?" asked the youngest urchin.

"You know, dummy," snapped urchin number two. "Now he's gonna do the shtick about Monster Mire."

"What a drag," said Turkey's precocious niece who thought she was Farrah Fawcett Majors, "Tell us about Dr. Evildoom and the wicked witch –"

"That's boring! I wanna hear the cave routine –" said a neighbor kid.

"Cave routine, schmrave routine," said the eldest urchin. "I'm gonna watch *Saturday Night Live* instead."

"Yaa! Yaa! *Saturday Night Live!*" they all exclaimed.

"Guess you're gonna have to touch up the old act," said Mrs. Turkey as the din of stampeding feet faded into the TV room.

"Act, schmract," said Turkey as he shuffled off to his basement study for a rousing round of Lunar Lander on the computer.

Now it so happens that in Turkey's house there is a dark creaky stairwell that leads down to Turkey's computer domain. Turkey had meant for some time to fix the light, but a certain problem getting his computer to talk to his Selectric terminal had kept him rather preoccupied. (See "Techno Turkey his Electric Selectric", September *PC.*) Now, as Turkey groped down these stairs with goblins on his mind, his face brushed a cobweb, which startled him; his sudden shift in weight triggered a creaky tread, which made him jump even higher; and as he came down his foot kicked a toy car which clattered down into the darkness.

Needless to say, with all this, Turkey's heart sprang up into his wattle, did a double gainer and arced back into his chest again. And the adrenaline was still surging as he made his way into the study where the faintly glowing pilot light on his computer began to sooth him.

Turkey turned on the video monitor and all of a sudden it struck him. Of course! A real haunted house! As real, that is, as modern technology can make it! He turned over an old envelope and started scratching feverishly and he scratched well into the night.

"Parallel ports!" thought Turkey. "I need a flock of 'em." As Turkey poured through his system documentation he discovered that his TDL System Monitor Board had two input/output ports, but both seemed to be tied up with one thing or another.

"How is my computer going to tell the skulking skeletons and galloping ghosts what to do without a spare port or two?" thought Turkey, not that he was all that sure what a parallel port did or how it did it. But Turkey jotted down task number one anyway: Add more ports to my system.

"Now, assuming I have the ports I need, how am I going to transform the feeble 5-volt logic signals that these ports put out into righteous control of real electrical power that'll drive my clanking chains and eerie lights? Some kind of relay, I suppose," Turkey thought. So task number two was to work out a system that would allow his computer to control honest-to-goodness 110V AC house power.

"Moreover," Turkey thought, "I not only want the ghouls and goblins in my house to do things, I want them to *respond* to things – like the little gobblers who visit the house – and for this I need various kinds of people sensors." So task number three was to figure out some simple sensing devices that would tell his computer when to spring its blood-curdling surprises.

"And, finally," Turkey thought, "I'll need some clever software to turn all these bits and pieces into a genuine horror show."

Turkey looked at his computer with renewed respect and shivered with glee at the bone-chilling effects that were racing through his mind. He'd fix their jaded little wagons good, he thought. Yes, indeedy, he would!

Next day, Turkey went to the computer store.

"Have I got a system for you!" said the man behind the counter when Turkey explained what he had in mind.

"Look at this! It's got 2K of ROM and 2K of RAM and its got one purpose in life – controlling electrically powered devices!"

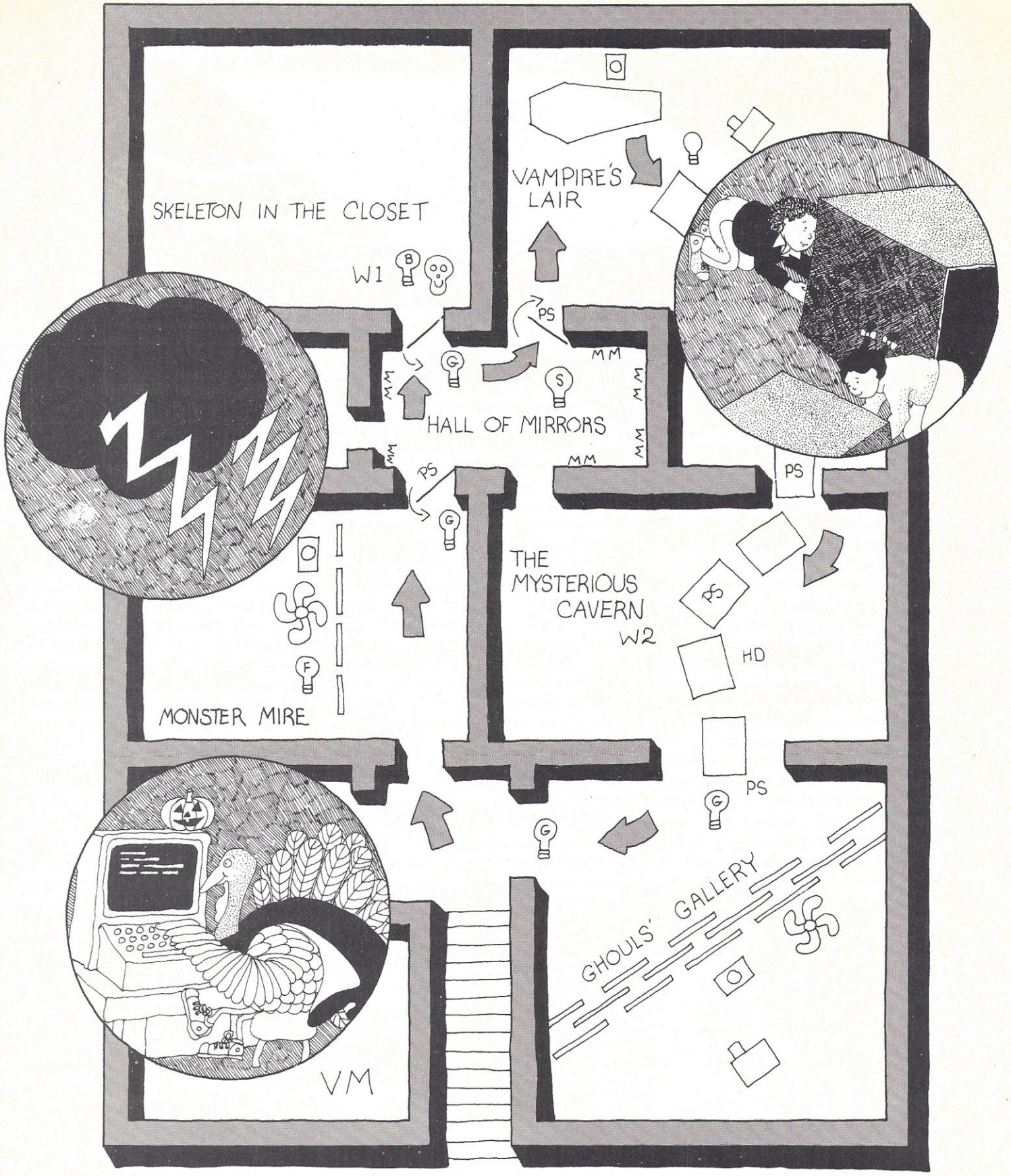
"No kidding," said Turkey.

"Yessiree! This little gem will control up to 100 electrical devices. You can tell it what time of day, what day of the month and what month of the year you want each device to turn on. You can tell it how long to let each device run. And built-in batteries save the program for up to four hours in case of power failure.

"Sounds good," said Turkey. "What's it called?"

"The Coby I."

"How much?"



G – guide light
F – flood light
S – strobe light
B – black light
VM – video monitor
PS – people sensor
fan
speaker
cleesecloth scrim
MM – milar mirror
skeleton
W1/2 – whizzers 1 & 2
casket
projector
refrigerator boxes

Illustration by Penny Carter

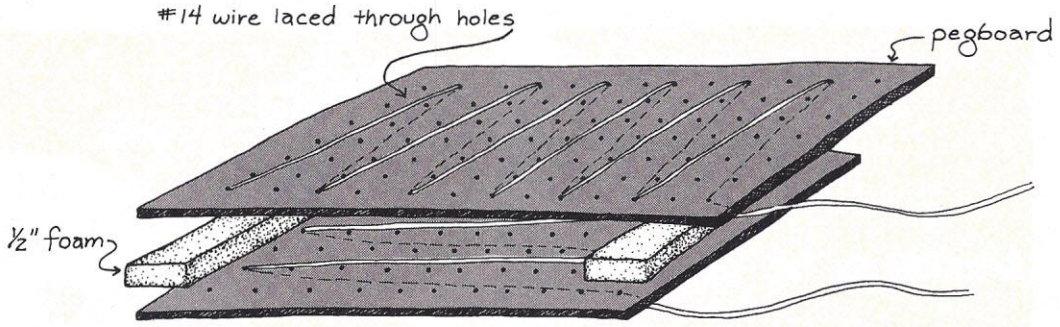


Figure 1

People detector – cut pegboard approx. 18″ square – lace #14 wire through holes in opposite directions – glue pegboard and foam separaters into a sandwich – cover with a throw rug. When someone steps on it, wires on opposite pieces of pegboard touch, completing a circuit.

"Only $600."

"I see – "

"And each remote power control unit costs only $60."

Turkey gulped.

"How many devices did you want to control?"

"About 20 – "

"So you can get that haunted house of yours off the ground for only . . . " The salesman whipped out a pocket calculator, " . . . only $1800!"

"Little out of my range," said Turkey tersely.

"Well then, what about Mountain Hardware?"

"What's that?"

"Just one of the niftiest computer accessories on the market today! Plugs right into your S100 bus. And listen to this: it puts the control signals needed to control electrical outlets out through the existing AC lines, so you don't have to string a bit of wire. You can control up to 64 independent 500-watt AC receptacles."

"And how much does that cost?"

"The main controller board's only $329."

"Not bad," said Turkey.

"And each Dual Channel AC Remote is going to set you back $99."

And once again Turkey's hopes were dashed.

"Still too much, huh?"

The big bird nodded his head.

"Well I suppose you could use one of the relay boards like the Mullen or the Gimix and kludge something together . . . "

"What are those?" Turkey asked.

"They're S100 boards with a bunch of relays mounted on them. But I don't have any information."

"I don't know," said Turkey. "I'm about as handy as a . . . well, as a chicken when it comes to wiring things up."

"I guess I just can't help ya, fellow," said the salesman as he punched up a Pong game on the Apple II sitting on the counter.

Turkey was seriously considering giving up the whole haunted house insanity altogether when he thought of an old friend, Mylo, who reputedly could do with copper wire and electrical dohickies what Michaelangelo did with paint.

"No sweat, Turk Old Buddy," said Mylo when Turkey explained the problem. "Think of that old electricity flowing through your house wiring as a raging torrent of a river, except in this case the current is rushing first up stream and then down again 60 times a second.

"So what you've got to do is dam up the old flow – stick yourself a dam in the wire that your computer can open up or close down anytime it wants."

"And pray tell, how am I going to put a dam in my house wiring?" asked Turkey, thinking of Grand Coulee.

"Well, not exactly in your house wiring. You make yourself up an extension cord, see; you know, like plugs in-

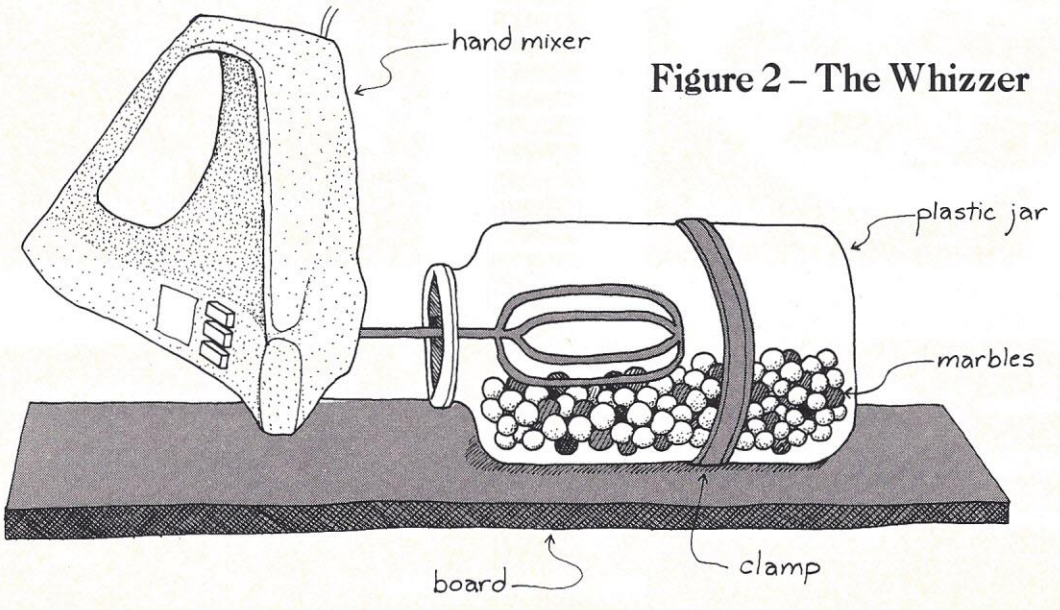


Figure 2 – The Whizzer

Figure illustrations by Susan Howard

to the wall. Then you put your dam in one wire of the extension cord."

"It's been a terrible day, Mylo," said Turkey, holding his head. "How do I dam up an extension cord?"

"With one of these little beauties." Mylo held up a small black thingamabob with three wire leads sticking out.

"I think I'm getting a headache," said Turkey.

"Called a triac," Mylo continued. "Take your extension cord, see, and then cut one of the wires up near the female receptacle –" Mylo whipped his wire cutters and with a deft flick snipped into a cord snaked across his workbench. "Better be sure everything's unplugged, of course, or you'll be one barbequed bird before you're done. But, anyway, now you got yourself two bare wires, see. Connect one wire to this here lead, MT 1, and the other to this here lead, MT 2." Mylo's soldering iron sizzled as he made the connection. (See Fig. 11.)

"And what about that third wire sticking out of the triac?"

"That's the trigger. That's how your computer stops or starts the flow through the dam."

Now Turkey began to see the light. "I see! I see!" he said excitedly. "Just plug that lead into the computer and you can turn the triac off and on, right?"

"Whoa, not so fast, Old Buzzard. It's not quite that simple. You got a few little details to work out."

"Like what?" Turkey asked suspiciously.

"Well, you said you were going to be turning electric motors on and off, right?"

"Right."

"Well, when you turn on an electric motor you get a heck of a magnetic field built up around the coils of the motor."

"So?"

"So, when you turn off that motor the magnetic field collapses and sends one big nasty jolt of electricity down the wire."

"And?"

"And, sometimes, it just might be too much for your triac to handle. Might just turn it right back on – something like a flash flood breaking down the dam."

"Just what I need," said Turkey. "A dam that can't turn off electric motors. Got any other good ideas, Mylo?"

"Not so fast; give me time. To fix this situation you just stick a resistor and a capacitor in series across the main terminals of the triac."

"Now I know I'm getting a headache," said Turkey. "What do they do?"

"They soak up any inductive kick that comes screaming down the wire when you turn off a motor."

"I see. Like using a giant sponge to catch the overflow of the dam, right?"

"Sort of –"

"So how do I hook this thing up to my computer?"

"When you solder one end of a 100-ohm resistor to Main Terminal 2, see –" Mylo pursed his lips as he completed the connection, clipped a test lead in place, plugged his electric drill into the extension cord and plugged the extension cord into the wall. Turkey noticed that he always kept one hand behind his back when he was working near a live circuit.

"Now, when I connect the free end of the resistor to the trigger lead of the triac, voila!" The workshop filled with the roar of the drill. When he removed the test lead, silence reigned.

"Wonderful, Mylo," said Turkey. "All my computer has to do is reach out and connect up the test lead every time it wants to turn on the triac, right?"

"No, as a matter of fact, there's a better way."

"And how's that?"

"You close the contact with a relay."

"A relay! Mylo, this thing's getting more and more complicated all the time!"

"So, whoever told you there was a free lunch?"

"Yeah, but why didn't we just use a relay in the first place – skip the triac and all that other bother?"

"You could, but then you'd need a big old expensive industrial relay that draws even more current and starts putting out inductive pulses of its own and you'd have nasty contact arcing and – uh! It depresses me to think about it!"

"OK, so we use a small el cheapo relay. How does my computer turn it on or off?"

"A relay driver. How else?"

"Great! Maybe we can get Paul Newman! Oy – Do I need an Excedrin," said Turkey.

"We could control the relay with a single transistor if we wanted to, but I've got something else in mind."

"I can't wait."

"Look, you've still got a few problems here, the way I see it. You've got to drive the relay, which takes a fair amount of current – at least, more than your port can supply.

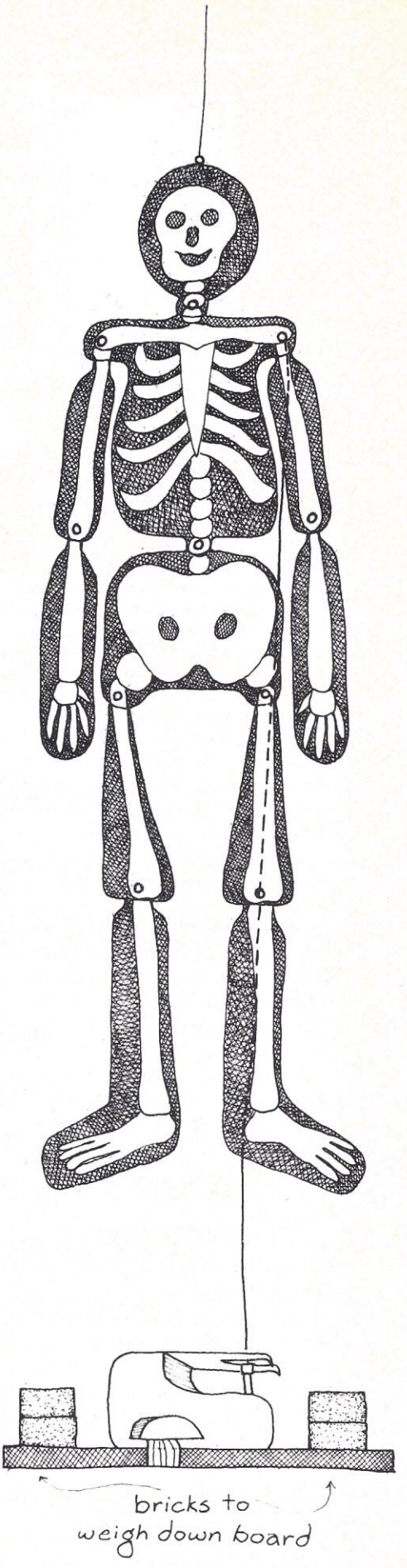


Figure 3

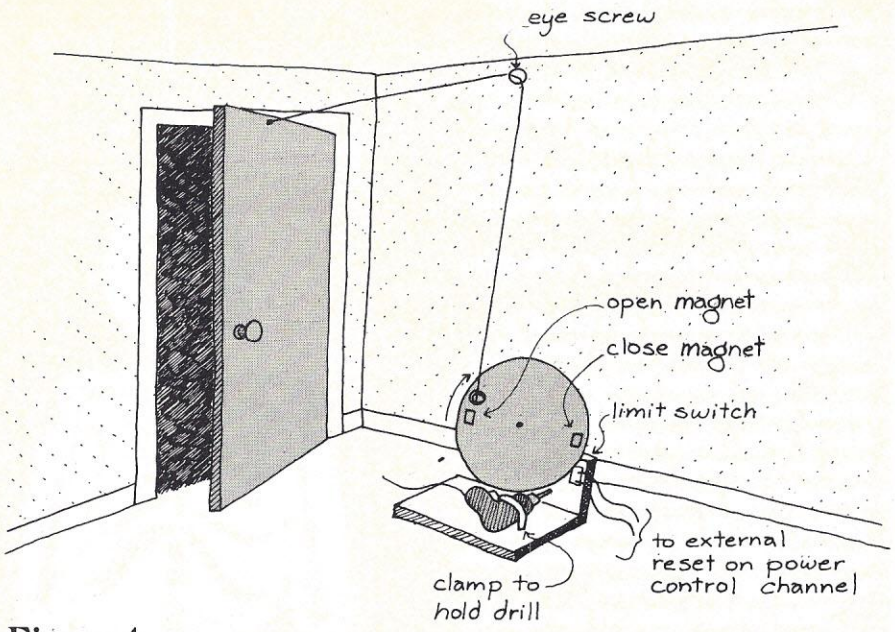


Figure 4

Door opening device – when computer turns on the electric drill, the disk turns. When the string is pulled to the bottom of the disk, the door opens. As the string revolves to the top of the disk, the door can be pulled closed by a weight on a string running through an eye screw in the sill.

You probably want to latch the relay so it stays on while the computer's off doing other things." (See Fig. 10.) "And you need to decode the signals from the output port so that –"

"Wait! Wait one minute! What do you mean 'decode the signals from the output port'?"

"You want to control a lot of circuits, right?"

"Right."

"If you latch the relay that controls each circuit, it's going to take two bits to control each one – one bit to turn it on and another turn it off. But you've only got eight bits per parallel output port. So unless you decode you're going to need five ports to control twenty circuits when you really only need one to do the job." (See Fig. 9.)

"You mean I'll only need one output port?"

"That's all."

"Now you're talkin'! How do we get away with that?"

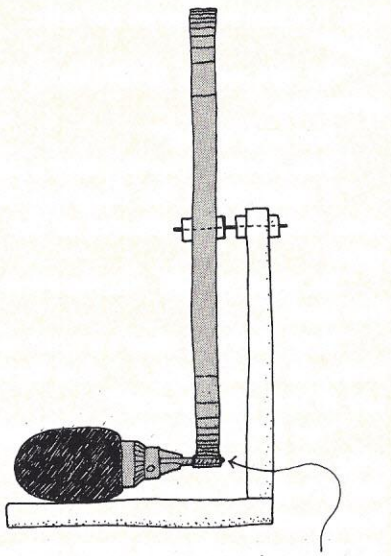
"We decode the eight bits coming out of the port the same way the computer decodes the address bus to access all its memory locations."

Turkey was looking morose.

"What's the matter, Old Bird?"

"There's a lot more to this than I expected."

"Well maybe. But it's not really so bad. I think we can handle each relay with just a few components and we need only one chip to decode up to



Detail of Figure 4

four relays. Not only that, but I'm gonna throw in a big bonus."

"What's that?"

"These power control units may end up some distance from the computer. When you try to run logic lines over a long wire you pick up noise problems something fierce."

"Terrific," said Turkey.

"I'm gonna throw in a line receiver that's the essence of simplicity –"

"I'm telling you my head's going to fall off, Mylo! What's a line receiver?"

"A circuit that accepts the valid logic signals coming down a long line, but tells any noise that comes along to go to blazes." (See Fig. 8.)

"Really, Mylo. This is quite beyond me –"

"Turkey, poor Cluck, tell you what I'm going to do: I'm going to design this Power Control System I'm talking about so you can buy every component you need at Radio Shack. You buy the parts and I'll wire up the first unit for you. We'll build them on a nifty little PC board that Radio Shack sells, so all you've got to do is drill a few holes, solder a few wires and you've got yourself a dandy Power Control Unit. Of course, if you want twenty of 'em, it'll be more work, but you can do it like an assembly line."

"No kidding!" said Turkey. "How much do you think it'll all cost?"

"You're paying premium prices at Radio Shack, but if you want to buy the convenience, I'd say . . . maybe less than $10 per controlled function."

"That means the electronics for the whole haunted house would come to around $200."

"If you shop for parts, you might get it down to $150. And not only that, after Halloween you can use the system to control anything you want around the house. That computer of yours just might start paying its keep."

"About time!" said Turkey, nodding assent. "About time that electron guzzler does some real work for a change!"

When Turkey left Mylo's he was quite excited. First thing, he visited all his friends and neighbors to scrounge some items he needed.

"Mrs. Webster, do you have an old electric mixer I could borrow for a few weeks? And how about a hair dryer?"

"Say, Claude, could I borrow your electric hand drill?"

"You've got a few old cassette players around? Wonderful!"

And he was absolutely ecstatic when a friend who managed a rock group loaned him a black light and a disco-type strobe.

For the next few weeks Turkey buried himself in his basement workshop.

"What's the old man up to?" his kids whispered among themselves.

"Don't know. Everytime he looks at me he giggles like a fiend."

"I'm not sure I like this one!" the littlest Turkey said.

Turkey made one more trip to the computer store to buy a parallel output board. Nearly everything was outside his price range, but he did find a super little kit by Solid State Music called an I/O & S-100 Proto-typing Card which gave him one parallel input port and one parallel output, plus large prototyping areas to add more ports if needed. While the concept of the board was terrific, he had to spend a whole evening at Mylo's figuring out how to put it together since the instructions were about as meaningful as the random memory patterns that showed up on his video monitor before he loaded a program into his computer.

Turkey also consulted two other VIPs. He talked the Wizard who'd helped him with his Selectric terminal into writing some software, and then he talked to Mrs. Turkey.

"You're going to do *what* to the house?" Mrs. Turkey exclaimed.

"It's only for one night –"

"Well I'm going to Mother's!"

"And miss all the fun?"

"It'll take me a week to dig out of the mess –"

"But look, when it's all over we can use the computer for the security system we need. And you know how the kids never turn out the lights when they leave a room? The computer can do it and save on our electricity bill! And listen to this –"

"I can't wait –"

"I can set this thing up so the computer can sense when the garden needs water and turn on the sprinklers automatically!"

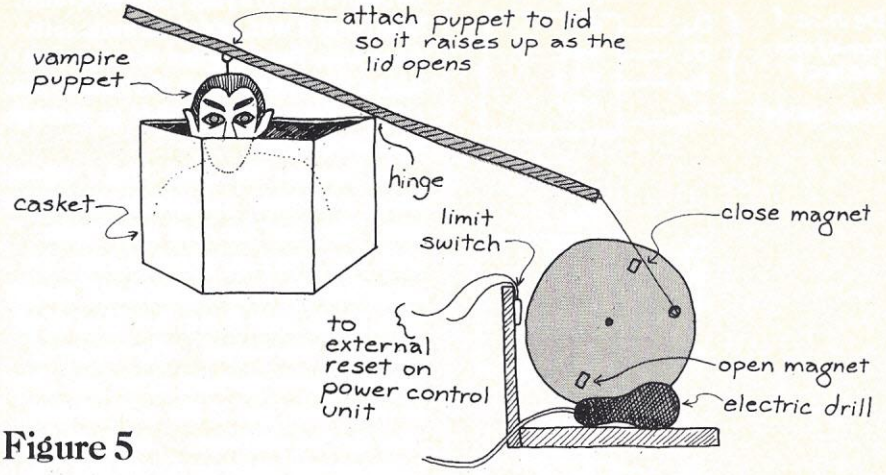


Figure 5

Device for opening lid to casket

"Alright already! But I've got one condition."

"What's that?"

"I get to paint the skeleton!"

(*Author's note:* What follows is quite frankly a fantasy. For some strange reason, magazine editors require Halloween stories around the Fourth of July. Since Turkey was having enough trouble getting his sparklers to sizzle, there was no way he could

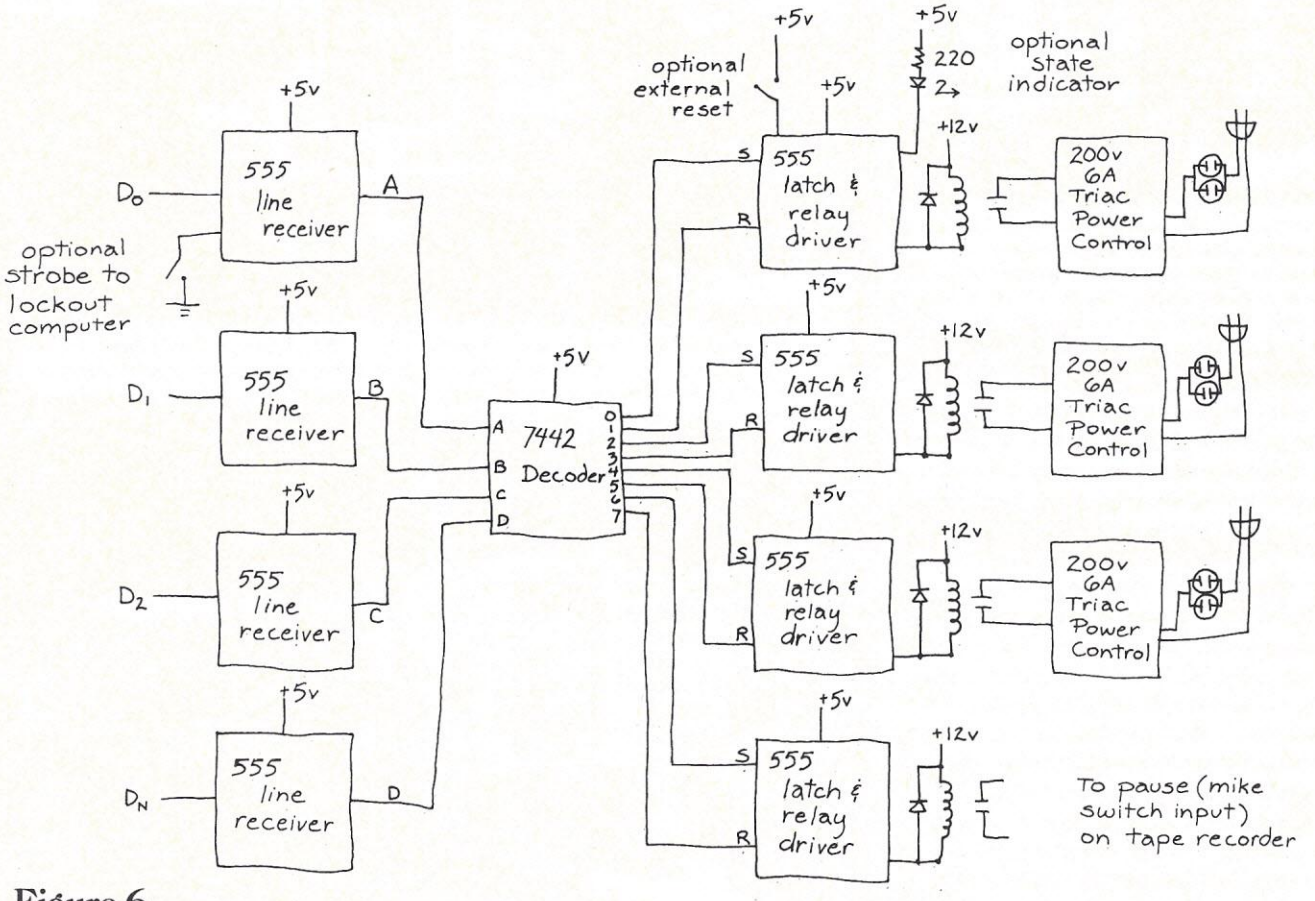


Figure 6

This shows how basic circuit modules are organized in one power control box. Haunted House requires five identical boxes – giving a total of 15 controlled 110V AC receptacles and 5 controlled low-current relay closures.

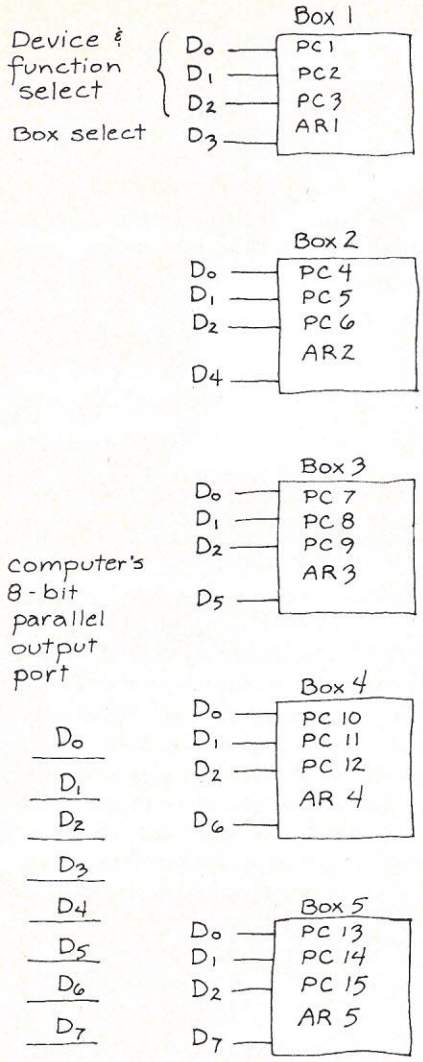


Figure 7

This diagram shows how the five power control boxes are wired up to the computer. In each box there are three 110V AC power controlled outlets and one low-current relay used to control the pause function (mike switch) on a tape recorder.

get the whole haunted house in place three months early. But Turkey schemed and dreamed anyway and gave us exclusive permission to share his innermost fantasies.)

The moon was a gigantic pumpkin on Halloween night. Turkey lurked just inside his front door, costumed appropriately as a Transylvanian count in silken tails. When the doorbell rang he ushered in the greedy little trick-or-treaters and invited them on a tour of his old family estate.

Mrs. Turkey, dressed like an ancient family retainer with a hunchback, accompanied them through the rickety old wrought iron gate that led into . . . Monster Mire!

Turkey then sat at his video monitor and traced the progress of the party through the terrifying inner sanctums. Satisfying it was, and even more satisfying were the delighted screams that issued from within and the flushed, excited children who asked to go through again and again.

In Monster Mire they meet a vicious storm with wind and thunder and lightning. They feel the mud ooze under their feet (they are asked to enter the estate barefoot) and spiders and creepy vines brush their faces. But most of all they hear the wolves – the baying of hungry wolves growing closer and closer. And then, just in the nick of time, they see the old house – dark, silent, looming and ominous on the hill. The door creaks open and a spooky voice invites them in . . . "Come in! Come into my house! The wolves are hungry tonight. Come into my house! It's dangerous in the Mire!" And they enter . . . The Hall of Mirrors!

Now the door creaks closed behind them. It's dark and eerie. Suddenly lights flash and strange shapes loom around them. Hideous laughter fills the air. Just as they think they're going mad, there's darkness and silence again. They try a door only to confront . . . The Skeleton in the Closet.

When they open the door, a skeleton glows in the dark. At first it's still and then suddenly jumps to life with a nerve-shattering rattle of bones. They slam the door and try another only to find themselves in . . . The Vampire's Lair.

In this room dim candles sit on a table. A faint red light flicks on and reveals a casket in the middle of the room! At that very moment the casket begins to creak open and a dark form with leering red eyes rises up out of

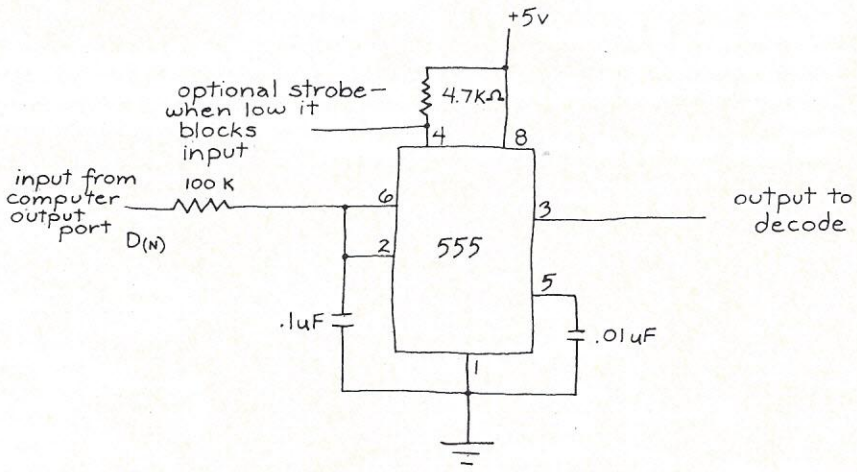


Figure 8

Line receiver – This circuit is quite insensitive to noise that builds up when the power control box is a long distance from the computer. The optional strobe input can be used to lock out computer control at the box itself – just run it through a switch to ground. Approximate cost including pc board – $1.50.

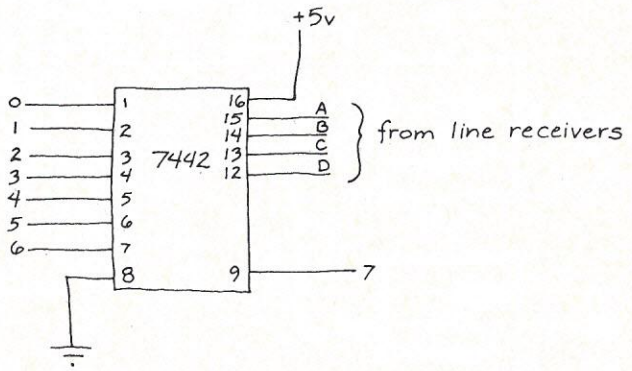


Figure 9

Decoder circuits – one needed to decode the on and off functions for four circuits within one power control box. Approx. cost including pc board – $1.

the box. Dracula himself! The room is plunged into darkness and they hear a hideous scream! Just in the nick of time a faint light and a soft voice beckons them into . . . The Mysterious Cavern.

It's dark in the cave. There are slimy, cold things on the floor and cobwebs brush their faces. Ghastly rattles come from the walls and a spooky voice bounces around in the cave. A strange gust of wind blasts them in the face just before they emerge into . . . The Ghoul's Gallery!

Here the air is filled with shimmering ghosts; luminous spirits; dark, contorted faces; monsters of every description. Just before their hearts come to a complete stop, a deep booming voice addresses them:

"You have passed unharmed through the most wicked ordeals devised by the Minds of Evil. Your hearts are Good, your souls are Pure. Go now! Go into the world of light and let no Shadow of Evil pass before you."

"This is terrific, Turk!" says Everet Mastermeyer, his neighbor. "Listen, I belong to the Jaycees and we do one of these every year down at the firehouse as a fund raiser. How about giving us a hand next year?"

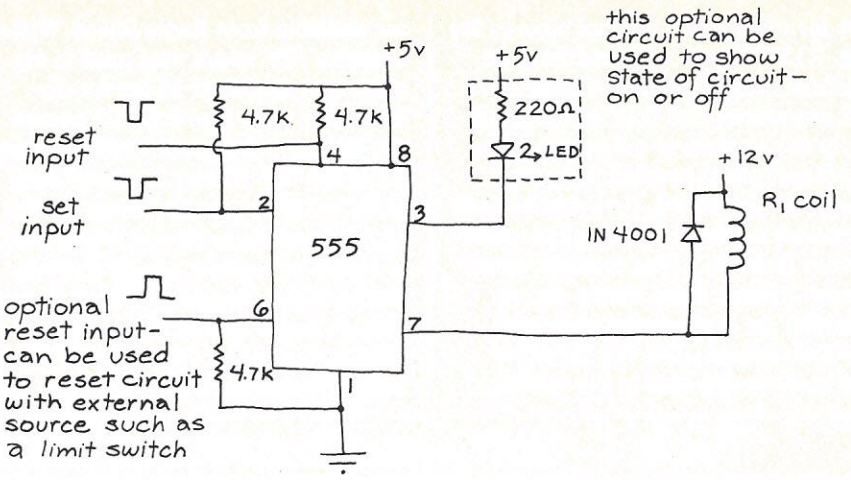


Figure 10

Latch and relay drives – when set input is brought from +5V to ground the relay turns on and stays on. When the Reset input is brought from +5V to ground, the relay turns off and stays off. Note optional LED state indicator and optional reset control. Approximate cost of circuit including pc board and relay < $4.00.

"I was really scared, Daddy!" said the youngest Turkey. "Did you do all of that with your computer?"

"Yeah, I even forgot to watch *Laverne and Shirley!*" said eldest urchin. "I'll get all my friends over to see this thing."

"What're you and your computer planning next?" asked Mrs. Turkey.

Turkey just smiled. Wait 'til Christmas, he thought to himself. Even old St. Nick is going to have the time of his life!

How it works

Most of the effects in the Haunted House are created around common audio-visual devices, household appliances and power tools. These items are turned on and off by the computer through

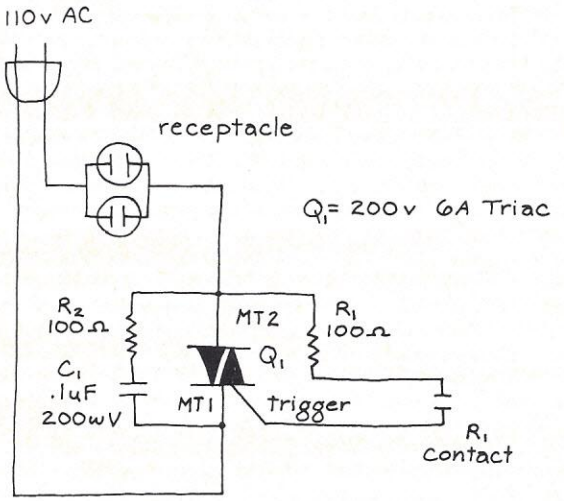


Figure 11 △

Triac power control circuit – When relay contact closes, triac turns on, providing power to the 110V receptacle. R_1 limits current in the triac trigger circuit and across the relay contact. R_2 and C_1 absorb large voltage surges that occur when motors are turned off. Approximate cost of circuit including pc board and receptacle <$3.

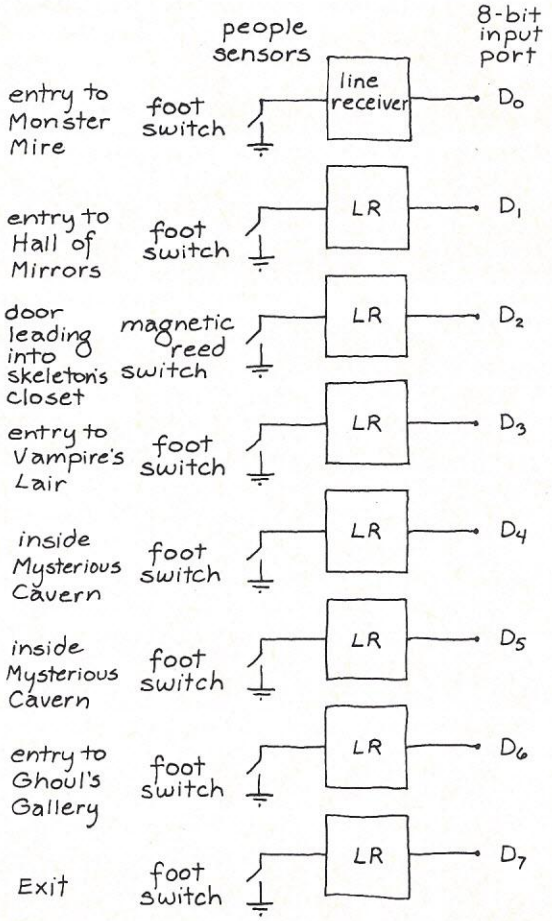


Figure 12 ▷

Sensor circuits. See Fig. 7 for Line Receiver Circuit.

five identical power-control boxes. (See Fig. 7.) Each box contains four independent control circuits – three 110V AC receptacles that may be independently switched on or off by the computer and one controlled relay, also computer controlled, that may be used to switch low-level direct current such as that found in a tape recorder pause control circuit. Four simple circuit modules are interconnected in each control channel. (See Fig. 6.) All of the components used in the modules are available from Radio Shack. While sensitive 12V relays were used in my prototype (required 10 ma for closure), any relay that does not exceed the voltage and current-handling capacity of the 555 IC may be substituted (15V at 100 ma max.). Power for the circuit modules in my prototype was provided by a power supply built up on the 5-Volt Regulated Power Supply Project Board sold by Radio Shack. Note in Fig. 6 that the optional strobe input to each line receiver module may be used to lock out computer control. This feature is useful when you want to work on a particular effect while the computer program is running. The optional external reset line into the latch/relay driver circuit is used to turn off the control channel independently of the computer. This feature is used in both the door opening effect and the casket opening effect. Limit switches detect the position of the disk in its cycle and stop rotation at the proper position. (See Fig. 4,5.)

Table 1 – Software Control and Variable Assignments

Control variables in program	Data codes to box on	Data codes to box off	Box number	Control unit	Controlled device	Effect
D(1) T(1) T1(1)	0FH	0EH	1	PC1	floodlight	Mount floodlight behind cheesecloth scrim in Monster Mire. Prop leaves and twigs in front of floodlight to cast eerie shadows on scrim. Program will flash floodlight at random intervals to simulate lightning. To add to the effect, put a water-soaked foam mattress pad on the floor. Use plastic drop cloth under the pad to protect the floor. All visitors should go through the house barefoot, of course. Hang soft twigs, leaves, threads, rubber creepy-crawlies from the ceiling over the path through Monster Mire.
D(2) T(2) T1(2)	0DH	0CH	1	PC2	fan	Fan causes cheesecloth scrim to ripple and creates wind effect in Monster Mire.
D(3) T(3) T1(3)	0BH	0AH	1	PC3	night light and electric drill that powers door opener	Toward the end of period in Monster Mire, a small night light goes on to guide attention to the door of the Haunted House. At the same time, the door starts to open, powered by the electric drill.
D(4) T(4) T1(4)	09H	08H	1	AR1	Relay controlling pause function (mike switch on tape recorder 1)	This tape unit has sounds of thunder and howling wolves on it. If you can't find a continuous cassette, you'll have to repeat the basic sound effects several times on a longer tape and rewind frequently between visitors to the house. Most of the audio effects work best on continuous cassettes.
D(5)	17H	16H	2	PC4	strobe light	Walls of the Hall of Mirrors are lined with mirrorized mylar film available from plastics supply houses. Unwrinkled aluminum foil will work in a pinch. Strobe light goes on when people sensor 2 is actuated, indicating a visitor has entered. A hangman hanging from the ceiling might add to the spookiness.
D(6) T(6) T1(6)	15H	14H	2	PC5	night light	At end of the Hall of Mirrors effect, a small night light comes on to illuminate the door leading to Skeleton in the Closet. On the door is a sign that says "OPEN ME".
D(7) T(7) T1(7)	13H	12H	2	PC6	blacklight	When the door is opened into the Skeleton's closet, a blacklight comes on to cause the luminous paint on a skeleton puppet to glow.
D(8) T(8) T1(8)	11H	10H	2	AR1	Relay controlling pause function on tape recorder 2	This tape unit has creaking door effect for door leading from Monster Mire into Hall of Mirrors. It also has creepy voice inviting visitors into the house – and hideous laughter that goes with the strobe light.
D(9) T(9) T1(9)	27H	26H	3	PC7	sabre saw electric mixer	Sabre saw controls movement of the skeleton puppet. See Fig. 3. The saw comes on about 15 seconds after the door into the Skeleton's Closet opens. At the same time, whizzer 1, powered by the electric mixer, comes on.
D(10) T(10) T1(10)	25H	24H	3	PC8	night light	This light guides visitor to door leading into Vampire's Lair. It comes on at end of Skeleton routine.
D(11) T(11) T1(11)	23H	22H	3	PC9	projector	A slide projector with deep red filter over the lens casts eerie light on casket in Vampire's Lair.

The optional LED state indicator lets you know whether a particular control channel is on or off.

Each power control box is connected to an eight-bit parallel output port through four data lines. Each of the five high-order bits coming from the port go to a separate box. These bits select which box receives a given control command. The three low-order bits go to all five power control boxes. These select which controlled function is turned on or off. Actual control commands are listed in Table 1.

Movement of people through the Haunted House is detected by a series of eight people sensors. These are simple switches, either activated when stepped on, or, in one instance, activated when a door is opened. (See Fig. 1.) These switches connect to an eight-bit input port through simple line receiver circuits to minimize the chance of false triggering due to noise picked up by the long cables connecting the sensor switches to the computer. (See Fig. 8.)

Every half second or so the computer checks the input port to see if a sensor has been activated. For every output control channel N (where N = 1 to 20) there are three associated timing variables in the Haunted House program. The D(N) variable determines the length of time between actuation of the input sensor and execution of control function N. If the control function is off and is supposed to be turned on at the end of the D(N) delay, then the T(N) variable deter-

Table 1 – Software Control and Variable Assignments

Control variables in program	Data codes to box		Box number	Control unit	Controlled device	Effect
	on	off				
D(12) T(12) T1(12)	21H	20H	3	AR3	Relay controlling pause function on tape recorder 3	This tape has creepy sounds associated with casket opening in Vampire's Lair. At end of segment is a bloodcurdling scream.
D(13) T(13) T1(13)	47H	46H	4	PC10	electric drill	The electric drill powers the casket opening device. It comes on about 10 seconds after visitors enters Vampire's Lair. The vampire dummy is hung from the inside of the casket lid so the dummy rises as the lid opens. Use light-emitting diodes to make the dummy's fiery eyes. A limit switch on the casket opening device actuates the manual reset switch on PC10 to stop the electric drill when the casket is fully open. When the visitors trip the people sensor at the entrance to the Mysterious Cavern, the computer program closes the casket to prepare for the next visitor.
D(14) T(14) T1(14)	45H	44H	4	PC11	night light	This light guides visitors into the Mysterious Cavern. It goes on at the end of the Vampire effects.
D(15) T(15) T1(15)	43H	42H	4	PC12	electric drill	A stiff piece of rope about 8" long is mounted in the chuck of the drill. The drill is clamped to a support outside one of the boxes used for the Mysterious Cavern. (The cavern itself is made of refrigerator or other large appliances boxes.) When the drill goes on, triggered by the people sensor at the entrance to the cavern, the rope whaps against the side of the box with nerve-shattering effect on anyone inside the box.
D(16) T(16) T1(16)	41H	40H	4	AR4	Relay controlling pause function on tape recorder 4.	This tape unit plays all the sound effects that go with the Cavern routine.
D(17) T(17) T1(17)	87H	86H	5	PC13	electric hair dryer	When the second people sensor in the Cavern is actuated, the electric hair dryer goes on, blasting hot air into the cave through a hole in the box – ideally about face level. Incidentally, the cave can be made even creepier by hanging threads from the tops of the boxes, sprinkling cooked spaghetti on the floor (feels like worms when you step on it barefoot) and putting one or two plastic bags filled with ice on the floor of the cavern – eyuck!
D(18) T(18) T1(18)	85H	84H	5	PC14	fan and slide projector	Hang cheesecloth scrims from the ceiling. Fan is aimed to make cheesecloth ripple. Projector is set on automatic slide advance to project ghosts, witches, ghoulish faces and so forth on the three scrims. Since the images are projecting through one cheesecloth onto another, there will be three images hanging in space for each slide.
D(19) T(19) T1(19)	83H	82H	5	PC15	night light	This light guides visitors out of the Haunted House at the end of the Ghoul's Gallery routine.
D(20) T(20) T1(20)	81H	80H	5	AR5	Relay controlling pause function on tape recorder 5	This relay provides audio for Ghoul's Gallery – chains clanking, groans and voice at the end.

mines the length of time the function will stay on once executed. If the function is on and is supposed to be turned off at the end of the D(N) delay, then the T1(N) variable determines the length of time the function will stay off once executed. Using both the T(N) and T1(N) variables in the output routine lets the control function flash on and off repeatedly.

Actual timing of the system will depend upon the clock speed of your computer and the speed of your particular BASIC. Thus, the timing values shown in the program are nominal and will have to be adjusted to fit your system. A value of 1 assigned to the D, T or T1 variable corresponds to one cycle through the main loop of the program. In my system, this cycle corresponded to about 0.5 sec. Thus, if D(3) = 20, say, then power control channel 3, which is controlled by D(3) according to Table 1, will be actuated approximately 10 seconds after people sensor 1 is activated.

Table 1 also shows how the different effects are produced. Wind effects are produced by window fans; lightning is produced by flashing a floodlight on and off quickly at random intervals. Sound effects are recorded on continuous-loop cassette tapes (available from Lafayette).

Several special effects are shown in Fig. 2 through 5.

Safety should be carefully considered in every phase of the Haunted House design and layout. All electromechanical devices should be well enclosed or otherwise kept out of the path through the house. Wiring should be strung very carefully so visitors don't accidentally trip. All electrical circuits should be enclosed and kept away from sinks, toilets, bathtubs or other watery environments where electrical shock is a possibility. In other words, when the house is set up, go through it several times looking for potential hazards and eliminate them.

Program Listing

BY PETER HENRY

```
10 E=0
20 REM ****** TECHNO TURKEY'S HAUNTED HOUSE CONTROLLER ****
30 REM ***************************************************
40 REM WRITTEN BY          PETER HENRY      JULY, 1978
50 REM ***************************************************
60 REM THIS PROGRAM MAY BE MODIFIED FOR OTHER APPLICATIONS
70 REM WHERE A TIME (OR UNTIMED) RESPONSE TO RANDOM (I.E.
80 REM HUMAN) STIMULUS IS TO BE RESPONDED TO.
90 REM ***************************************************
100 DIM D(20),T(20),F(20),T1(20),P(8)
110 O2=1
120 REM O2 IS AN OPTION FLAG THAT, WHEN SET TO 1, CAUSES A
130 REM CHECK TO BE MADE TO SEE IF A PORT IS ON OR OFF WHEN
140 REM IT IS TURNED OFF OR ON (RESPECTIVELY).  THIS SLOWS
150 REM THE PROGRAM, BUT MAKES IT MORE RELIABLE.....
160 FOR A=1 TO 8
170 P(A)=0
180 REM P IS THE SET OF PEOPLE SENSOR FLAGS, WHICH HELP TO
190 REM DETERMINE IF A PERSON IS JUST STANDING ON A PEOPLE
200 REM SENSOR, IN WHICH CASE THE SIGNAL IS IGNORED...
210 NEXT A
220 REM T IS TIME TO OFF CONSTANT
230 REM T1 IS TIME TO ON CONSTANT
240 REM D HOLDS THE TIME CONSTANTS FOR EACH OUTPUT, AS WELL
250 REM AS THE FUNCTION TO BE PERFORMED ON 'TIMEOUT'.  THIS
260 REM WORKS AS FOLLOWS.....
270 REM EACH D VARIABLE IS INITIALIZED TO 0 AT THE START OF THE
280 REM PROGRAM.  THE MAIN LOOP OF THE PROGRAM DECREMENTS EACH
290 REM D VARIABLE BY ONE.  WHEN A VARIABLE GETS DECREMENTED
300 REM BELOW 0, THE FUNCTION IS PERFORMED FOR THAT DEVICE.
310 REM   THE FUNCTION IS DERIVED BY TESTING THE VARIABLE TO
320 REM SEE IF IT EQUALS ITS INTEGER PART.  IF IT DOES, THE
330 REM DEVICE IS TURNED OFF.  IF THE NUMBER
340 REM IS NOT AN INTEGER, HOWEVER, THE DEVICE IS TURNED ON.
350 REM     THEN 'TIMER'  CONSTANT IS LOADED INTO THE D VAR-
360 REM -IABLE FROM THE CORRESPONDING T VARIABLE.  THIS
370 REM CONSTANT IS FOR PURPOSES OF TURNING A DEVICE ON
380 REM (OR OFF IF IT WAS JUST TURNED ON) AFTER A CERTAIN
390 REM TIME DELAY.  FINALLY, WHENEVER A DEVICE IS TURNED ON
400 REM OR OFF, THE CORRESPONDING FLAG (F) VARIABLE IS TURNED
410 REM TO 1 OR 0.  THIS IS NOT REALLY NEEDED, BUT IT
420 REM HELPS TO SPEED UP THE PROGRAM.
430 FOR A=1 TO 20
440 D(A)=0
450 T(A)=0
460 T1(A)=99999999
470 F(A)=1
480 NEXT A
490 REM ***** THIS IS THE MAIN LOOP
500 I=80
510 O=80
520 REM ***THE ABOVE ARE THE INPUT AND OUTPUT PORT NUMBERS...
530 REM THEY MAY HAVE TO BE CHANGED FOR DIFFERENT SYTEMS.
540 FOR G=1 TO 20
550 D(G)=D(G)-1
560 IF D(G)>0 THEN 610
570 A=G
580 PRINT "UNIT #";A;" HAS TIMED OUT."
590 IF D(A)=INT(D(A)) THEN GOSUB 1100 ELSE GOSUB 1320
600 REM TURN IT OFF OR ON DEPENDING ON INT() RESULT
610 NEXT G
620 PRINT "MARK...";
630 PRINT
640 REM SAMPLE THE PEOPLE SENSORS...
650 S=INP(I)
660 REM THIS BINARY BREAKDOWN ROUTINE COULD BE MORE EFFICIENT
670 REM IN TERMS OF THE PROGRAM BEING OPTIMIZED, BUT A LIST
680 REM OF 8 IF STATEMENTS IS THE FASTEST WAY POSSIBLE ON
690 REM MOST MICROCOMPUTERS TO BREAK A BYTE INTO 8 BITS.
700 IF S<128 THEN P(1)=0
710 IF S<128 THEN 750
720 IF P(1)=1 THEN 750 ELSE P(1)=1
730 GOSUB 1600
740 S=S-128
750 IF S<64 THEN P(2)=0
760 IF S<64 THEN 800
770 IF P(2)=1 THEN 800 ELSE P(2)=1
780 GOSUB 1890
790 S=S-64
800 IF S<32 THEN P(3)=0
810 IF S<32 THEN 850
820 IF P(3)=1 THEN 850 ELSE P(3)=1
830 GOSUB 2070
840 S=S-32
850 IF S<16 THEN P(4)=0
860 IF S<16 THEN 900
870 IF P(4)=1 THEN 900 ELSE P(4)=1
880 GOSUB 2200
890 S=S-16
900 IF S<8 THEN P(5)=0
910 IF S<8 THEN 950
920 IF P(5)=1 THEN 950 ELSE P(5)=1
930 GOSUB 2430
940 S=S-8
950 IF S<4 THEN P(6)=0
960 IF S<4 THEN 1000
970 IF P(6)=1 THEN 1000 ELSE P(6)=1
980 GOSUB 2500
990 S=S-4
1000 IF S<2 THEN P(7)=0
1010 IF S<2 THEN 1050
1020 IF P(7)=1 THEN 1050 ELSE P(7)=1
1030 GOSUB 2580
1040 S=S-2
1050 IF S=0 THEN P(8)=0
1060 IF S=0 THEN 1090
1070 IF P(8)=1 THEN 1090 ELSE P(8)=1
1080 GOSUB 2700
1090 GOTO 540
1100 REM TURN OFF THE DEVICE ROUTINE...
1110 IF O2=1 THEN 1160
1120 IF F(A)=1 THEN 1150
1130 PRINT "DEVICE STATUS SAYS: DEVICE ALREADY OFF!"
1140 GOTO 1310
1150 REM DETERMINE THE BOX #...
1160 B1=INT((A-1)/4)+1
1170 REM DETERMINE THE LINE #...
1180 L=A-(B1-1)*4
1190 PRINT "DEVICE IS DESIGNATED: BOX";B1;" LINE";L
1200 REM ASSEMBLE THE COMMAND, AND OUTPUT IT...
1210 C1=1
1220 FOR X=1 TO B1+2
1230 C1=C1+C1
1240 NEXT X
1250 C1=C1+(L-1)*2
1260 OUT O,C1
1270 PRINT "DEVICE";A;" TURNED OFF..."
1280 PRINT
1290 D(A)=INT(T1(A))+.5
1300 F(A)=0
1310 RETURN
1320 REM TURN ON DEVICE ROUTINE...
1330 IF O2=1 THEN 1380
1340 IF F(A)=0 THEN 1370
1350 PRINT "DEVICE STATUS SAYS: DEVICE ALREADY ON!"
1360 GOTO 1530
1370 REM DETERMINE BOX #
1380 B1=INT((A-1)/4)+1
1390 REM DETERMINE THE LINE #
1400 L=A-(B1-1)*4
1410 PRINT "DEVICE IS DESIGNATED: BOX";B1;" LINE";L
1420 REM ASSEMBLE COMMAND...
1430 C1=1
1440 FOR X=1 TO B1+2
1450 C1=C1+C1
1460 NEXT X
1470 C1=C1+(L-1)*2+1
1480 OUT O,C1
1490 PRINT "DEVICE";A;" TURNED ON..."
1500 PRINT
1510 D(A)=INT(T(A))
1520 F(A)=1
1530 RETURN
1540 REM EACH PEOPLE SENSOR ROUTINE IS CUSTOMIZED TO DO
1550 REM SOME SPECIFIC ACTION WHICH IS TO BE DONE AFTER
1560 REM A GIVEN PEOPLE SENSOR HAS TRIGGERED.....
1570 REM THEREFORE, IN THIS ARTICLE, THE ROUTINES HAVE
1580 REM BEEN WRITTEN TO CORRESPOND TO THE SCENARIO OF
1590 REM TECHNO TURKEY'S HAUNTED HOUSE.....
1600 PRINT "PEOPLE SENSOR 1 TRIGGERED!"
```

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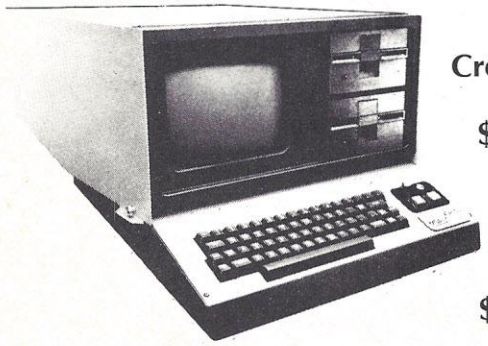
CIRCLE 14

A Great Microcomputer At A Fabulous Price From Computer Enterprises:

The VDP-40
Video Data Processor



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Designed for the office or for the home, the IMSAI Video Data Processor, the VDP-40, places a microcomputer well within the budget of the average small businessman or systems developer. The VDP-40 may be used to computerize the accounting and inventory functions of a small business. The VDP-40 can communicate to additional VDP-40s or other 8080/85-based computers, and can act as a terminal in a data communications network.

The VDP-40 is a fully integrated system, featuring an 8085 microprocessor, 32K RAM memory, two 5¼-inch floppy disks, 9-inch CRT, heavy-duty power supply, professional keyboard, terminated/regulated motherboard, and serial and parallel I/O ports in a handsome cabinet.

The IMSAI VDP-40 comes fully assembled and tested. Built-in serial and parallel I/O ports provide the means to connect, via appropriate cabling, peripheral devices including line printers, modems and auxiliary terminals. Built-in expansion capability allows the user to increase the RAM, I/O ports and number of disk drives.

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- Fully Integrated Computing System in a single Cabinet
- High Speed 8085 Processor
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CIRCLE 15

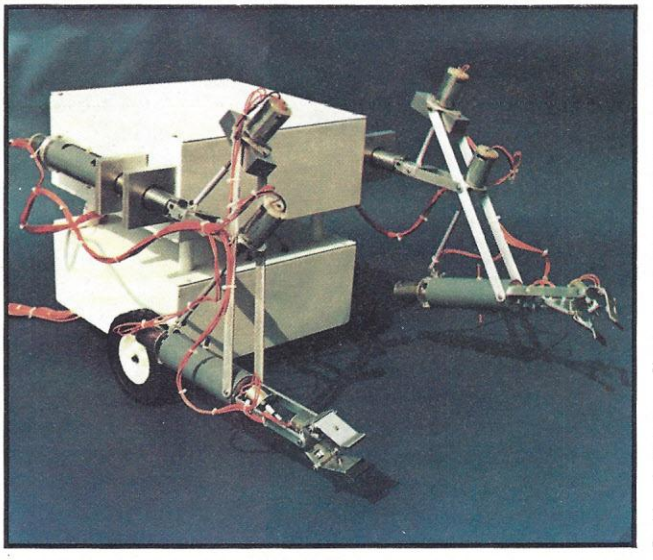
Program Listing continued

```
1610 REM WARY PERSON ENTERS MONSTER MIRE...
1620 IF E=1 THEN 1870
1630 E=1
1640 D(1)=.5
1650 T(1)=1
1660 T1(1)=INT(10*RND(1))+5
1670 D(4)=.5
1680 T(4)=10
1690 T1(4)=99999999
1700 D(2)=.5
1710 D(3)=.5
1720 REM DON'T TURN OFF DEVICES 2 AND 3... THEY SHUT THEM-
1730 REM SELVES OFF... JUST REMOVE THE LATCHED ON SIGNAL!
1740 REM DEVICE 16 IS A DUMMY DEVICE...
1750 T(16)=99999999
1760 D(16)=0
1770 T1(16)=99999999
1780 T(2)=99999999
1790 T(3)=99999999
1800 T1(2)=99999999
1810 T1(3)=99999999
1820 D(8)=10.5
1830 T(8)=20
1840 T1(8)=99999999
1850 E=1
1860 GOTO 1880
1870 PRINT "ENTRY TO MONSTER MIRE FORBIDDEN!!"
1880 RETURN
1890 PRINT "PEOPLE SENSOR 2 TRIGGERED!"
1900 REM HALL OF MIRRORS ENTERED!!
1910 D(1)=0
1920 T(1)=99999999
1930 T1(1)=99999999
1940 D(8)=.5
1950 D(3)=.5
1960 T(3)=10
1970 T(8)=25
1980 T1(3)=99999999
1990 T1(8)=99999999
2000 D(5)=25.5
2010 T(5)=5
2020 T1(5)=99999999
2030 D(6)=60.5
2040 T(6)=99999999
2050 T1(6)=99999999
2060 RETURN
2070 PRINT "PEOPLE SENSOR 3 TRIGGERED!"
2080 REM STILL MORE FRIGHT!!!
2090 D(6)=0
2100 D(7)=15.5
2110 T(7)=40
2120 T1(7)=99999999
2130 D(9)=25.5
2140 T(9)=15
2150 T1(9)=99999999
2160 D(10)=40.5
2170 T(10)=99999999
2180 T1(10)=99999999
2190 RETURN
2200 PRINT "PEOPLE SENSOR 4 TRIGGERED!"
2210 REM ***** WHAT ELSE??
2220 D(10)=0
2230 D(11)=.5
2240 T(11)=30
2250 T1(11)=99999999
2260 D(13)=10.5
2270 T(13)=99999999
2280 T1(13)=99999999
2290 D(17)=0
2300 T(17)=99999999
2310 T1(17)=99999999
2320 E=0
2330 D(12)=10.5
2340 T(12)=20
2350 T1(12)=99999999
2360 D(14)=30.5
2370 T(14)=99999999
2380 T1(14)=99999999
2390 D(16)=30.5
2400 T(16)=99999999
2410 T1(16)=99999999
2420 RETURN
2430 PRINT "PEOPLE SENSOR 5 TRIGGERED!"
2440 D(16)=0
2450 D(14)=0
2460 D(15)=.5
2470 T(15)=10
2480 T1(15)=99999999
2490 RETURN
2500 PRINT "PEOPLE SENSOR 6 TRIGGERED!"
2510 D(17)=.5
2520 T(17)=30
2530 T1(17)=99999999
2540 D(14)=30.5
2550 T(14)=99999999
2560 T1(14)=99999999
2570 RETURN
2580 PRINT "PEOPLE SENSOR 7 TRIGGERED!"
2590 D(14)=0
2600 D(18)=.5
2610 T(18)=10
2620 T1(18)=99999999
2630 D(20)=.5
2640 T(20)=10
2650 T1(20)=99999999
2660 D(19)=10.5
2670 T(19)=99999999
2680 T1(19)=99999999
2690 RETURN
2700 PRINT "PEOPLE SENSOR 8 TRIGGERED!"
2710 D(19)=0
2720 PRINT "SOME FRIGHTENED PERSON IS LEAVING THE HOUSE!!"
2730 RETURN
```

The "Grivet"

A New Traveling Companion for the Microcomputer

BY HARRY SHERSHOW



There's something strange moving 'round out there! And whatever it is, it ain't a robot! That, in essence, is the disclamation resounding from scientific circles as well as from the Gallagher Research Corporation. Seems that certain contraptions with blinking colored lights and electronic beeps, able to roam around rooms without knocking over chairs, are posing as robots. Not true, cry a number of observers from Carnegie Mellon and MIT. Their AI labs have scrutinized these publicity gimmicks, which claim to recognize people by voice, which carry on conversations, which are self-motivated and which, in general, insist they are intelligent robots capable of standing guard at security plants or assisting at surgical operations. The disclaimers say that these robots are hoaxes and are remotely controlled by a nearby attendant and that the voice the robot emits in its "conversations" with strangers is really the dulcet transmitted-tone of one of its handlers. In fact, one magazine bluntly calls this publicity-oriented robot "a lot of hokum." Like the ads for a hair-coloring company which ask "Which one is the real blond?" it seems that difficulties may arise when trying to pick out a real robot. John Gallagher, though, in this article and in other stories which he has released to the public, claims that his GRIVET is the genuine McCoy; the "basic ingredient" for the *first* true robot about to emerge.

Looking very much like the Land Rover that NASA sent to the Moon, the GRIVET has made its debut as the newest class of peripherals to emerge on the computer market since the appearance of the Periphicon camera. Unlike the popular "robots", which contain small dedicated computers and roll around rooms bleating electronic signals, the GRIVET is designed to be interfaced to any computer, just like a printer, VDT, voice synthesizer or scroller. When assembled and given a function, the GRIVET will be able to perform strange antics limited in scope only by the imagination of the programmer sitting at the keyboard of his computer.

Developer of this new peripheral family is a young physicist, John Gallagher, of the Gallagher Research Corporation and a physics graduate from Wake Forest University. His computer background includes two years in programming and architecture plus 1 1/2 years of microprocessor and microcomputer application design as well as software design.

How did he happen to pick robots and GRIVETs as his first business venture? "Well," he explained in a recent interview, "when microcomputers started hitting the market, three years ago, I was already working on a robot design – which I had started during my freshman year at college. I was waiting for an inexpensive computer system to show up. Five years ago there were *no* cheap computers. When they finally came out with inexpensive microcomputers I revived my project and started looking at it more seriously. I knew a future market for GRIVETs would exist once home computers became popular and had gained some reputation as a credible product. When that occurred – and that was about a year ago when Radio Shack came into the picture – the event marked the point when the micro became a viable product. I felt that the next product to emerge would be the hobby robot. So, we started about a year ago designing the GRIVET based on the work I had done four years before that and with which I had been tinkering ever since. One of the investors in our company happens to own seven factories here in North Carolina including a machine shop and plastic molding factories. We talked to him and got together with his engineers and staff of draftsmen and technicians and myself and we put together my rough sketches and balsa-wood models, worked them into a blueprint and finally emerged with the prototype. We had two failures before our current success."

The final, current product is a versatile "robot" that is unique in the fact that it doesn't do anything and is not a robot. "A robot in the popular sense of the word," explained the 26-year-old physicist, "is a mechanical contraption that rolls around the room,

shakes your hand and does useless things like picking up a cup of hot coffee and spilling it into your lap. These physical activities have been programmed into a computer which has been implanted within the robot itself and which causes the robot to do the things it does. I call my device a 'GRIVET', not a robot. GRIVET is an acronym for the Gallagher Research Incorporated Versatile Electronic Tool. A robot, you might care to know, is really a GRIVET with a computer inside. The GRIVET is the newest peripheral device on the market. When you, as a user, interface it with your own microcomputer – then what it does or what it will be able to do will be limited only by your own objectives. And its potential for doing that is absolutely unlimited!"

John Gallagher's enthusiasm for his product is so great that it bubbles over into his sales literature: "Interested in pioneering the most exciting frontier since the dawn of microcomputing?" he proclaims. "Then get a head start with the GRIVET! Years ahead of its time, this innocent looking toy represents one of the most revolutionary advances in the state-of-the-art, and through engineering simplification, it is now affordable!"

The GRIVET, in its stripped-down form, can't do anything until it's hooked into a computer. For demonstration purposes, it has been connected to wired switch-controls and has performed antics such as rolling around in precise paths, raising and lowering its arms, and picking up objects at one spot and placing them at another.

The GRIVET when it is unpacked and assembled is simply a "dumb" peripheral. It has no intelligence. But according to Gallagher, who plans to sell the device to other manufacturers as well as directly to hobbyists, such "intelligence" will quickly emerge. One dealer might program the GRIVET to do household chores; another will design it to play chess. No two dealers, according to John, will develop the GRIVET into the same final product. "It is going to be interesting," says Gallagher, "to see what emerges on the market in another year. You will observe a lot of strange and individualistic approaches to the product, and our own competitors will be people buying our parts. Customers will be able to buy a whole arm, a whole motorized base or a whole GRIVET. In fact, there's a group of students down at Northwestern that is considering the use of a single arm programmed to make proper moves in a chess game. We are hoping that somebody will realize that a single-chip interface can be used with our GRIVET."

Interfacing the GRIVET with a computer will not require any unique arrangements, according to Gallagher. "Of course," he admits, "different computers may have different requirements. I've heard of some people spending as little as $25 to interface to a computer while others have spent as much as $1000. Actually it can be done in many ways but we're not pushing any particular way of doing it. We are simply telling our dealers: Go ahead and sell it in any form you want to! They have a free hand. We do not sell the GRIVET assembled or pre-packaged in any way. We're only selling the parts – either one part or all of them – and they are all basically unlabeled. We won't have 'GRI' embossed on any part. So we expect a lot of people to be selling these GRIVETs assembled with *their* company name on it and with *their* computer and *their* program inside doing *their* particular work. And, it is then *their* product and *their* name, certainly, should be on it."

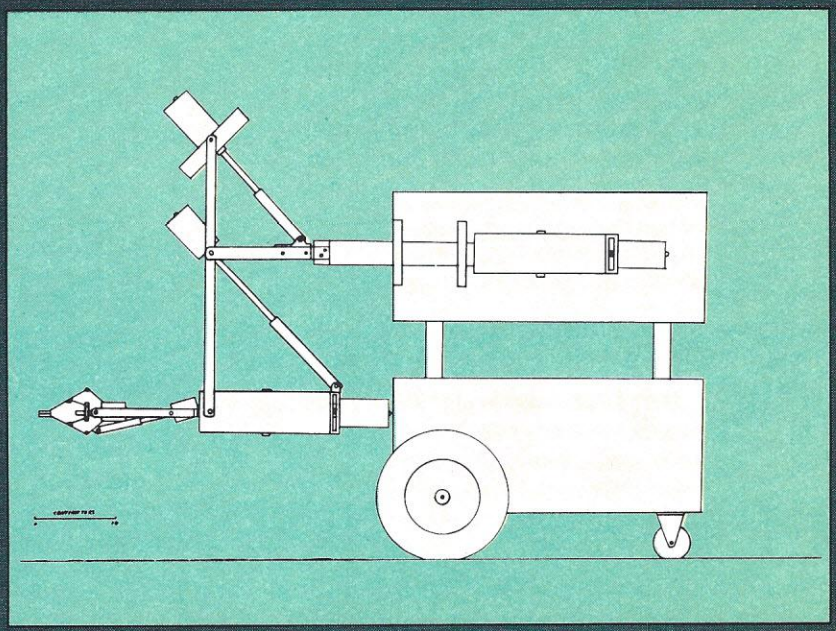
Average work-time for assembling the kit by a purchaser has been measured by the Gallagher company to be between 15 and 20 hours. The item shipped from the Gallagher warehouse is a finished product. No filing, no drilling and no sawing will be required in assembly. All the parts are there, just like a giant erector set. All the holes are pre-drilled at proper locations and it's just a matter of putting the parts to-

Specifications

Height	51 cm
Width	55 cm
Length	78 cm
Weight	20 kg
Turn radius	25 cm
Ground speed	3 km/hr
Reach	12 cm
Grasp	5 cm
Finger pressure	4 N
Lifting load	200 gm
Wrist rotation	180°
Shoulder rotation	180°
Hand tilt	45°
Elbow action	45°
Upper arm action	45°
No. of motors	20

Power Requirements

Base: 6V @ 8A
Arms: 4V @ 8A, 3V @ 2A



gether. No machine-shop work at all will be required.

After it is assembled and hooked into the computer, what will it actually be able to do? That is one of the questions usually thrown at the producer.

"It will be able to do," responds Gallagher. "Anything you have programmed it to do through your microcomputer. Anything."

In its physical configuration the GRIVET consists of two boxes, two wheels, one small tail wheel for stabilization and two moveable "limbs." The GRIVET weighs about 30 pounds empty and can carry an additional 30 pounds of hardware – computer, sensors, batteries, etc. The company recommends a total weight limit of 60 pounds. "More than that," says Gallagher. "And the wheels may stop rolling."

One of Gallagher's objectives in designing the GRIVET was to achieve versatility. His machines can now perform a wide variety of maneuvers. Most of the GRIVET's versatility is concentrated in the arm movements. These limbs have a smooth action because they do not depend on gear trains for activation. Robots, by comparison and as seen in movies, use exaggerated, jerky arm movements. With modifications, the fingers on GRIVET's hand can be arranged to handle things as fine as needles or as bulky as ash cans. The GRIVET can pick up and pour an opened can of beer. It holds a pencil tightly enough in its grasp to write a letter or draw pictures. The hands can also squeeze a person's finger quite hard (five-pound pressure) so the GRIVET is not a toy for curious children. The rapidity of its arm motion is an 18" arc in about one second. In brief, the GRIVET's arms are strong, fully articulated and can do anything that a human arm can do. (Its weight-lifting limits, at this time, are in the range of 5 to 10 pounds.)

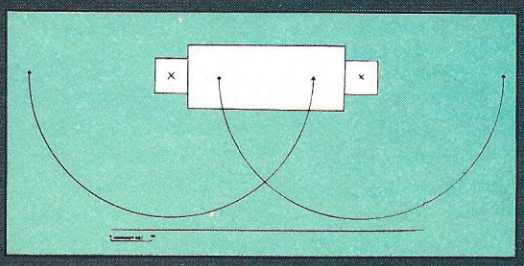
In current, ordinary computer applications, the programmer is responsible for system output. However, GRIVET owners, using the teach-repeat mode, will be able to program the computer himself. This control-transfer from the programmer to the end-user turns into great savings for any manufacturing-firm preparing to automate with robots. Yet it is simple enough for the hobbyist interested in robotics rather than in programming languages. "Here's a chance to be one of the first to pioneer in the field of robotics," exults Gallagher. "Because with automatons comes the second industrial revolution, and that's a revolution no one should want to miss!

"I have been asked in the past," he continues, "to make statements about GRIVET's ability similar to the statements made by other companies. Those statements that claim that the robot will be an android, capable of security defenses, capable of voice recognition and a lot of other things. But, you know, a lot of those statements can't be backed up with performance. We, ourselves, are simply stating that GRIVET is a dumb creature. Can't do anything by itself. What it does depends on what you, yourself, program it to do. You see, every customer will probably use his own ideas about how he wants the robot to function. We are not making capricious claims. We're sticking to what we know to be facts and what the GRIVET is physically able to do and what its limitations are. We are leaving it up to the individuals to make the robot intelligent enough to do something unusual. I'd be very surprised, and excited, for instance, if I learned that someone had programmed the GRIVET to do voice recognition. But the way we market it the GRIVET is incapable of doing anything until you turn it on and make the motors work and the wheels revolve. We sell everything short of intelligence. There are no additional accessories, no hidden gadgets, no different models that you have to buy to make it do a specific task. What you see is what you get – two empty boxes with wheels and two arms.

"The GRIVET is similar, at this time, to what the microcomputer looked like when it first came out. The skeleton model that MITS marketed was simply a box full of lights and switches. It was not designed, at that time, for any business application. You couldn't use it for anything, really. It didn't have a terminal, didn't have a printer or disk. But it did work as a computer would work and it made available to hobbyists, who were suffering from poverty, a computer without having to dish out $10,000. At last they could have one for $600! And what they did with it was up to them. And that's what we're doing. We are providing, for under $1000, a robot to anyone who wants one to play with, to tinker with, to build upon. We're basically hoping that everyone who buys one – and so far there have been quite a few purchases – will have the imagination and creativity to come up with answers and applications.

Manipulation

The arm modules have six motors and therefore six functions. The grandest movement is from the shoulder, which can swing the lower arm through 180°. As seen in the drawing to the right, the two arcs formed by the hands intersect. Thus the appendages co-operate in their tasks, while being driven separately. In the downward position, the arms pass through most doorways without any problems. G.R.I. designed the GRIVET for uneven surfaces and carpets. To make contact with the floor, one uses a larger caster in the rear.



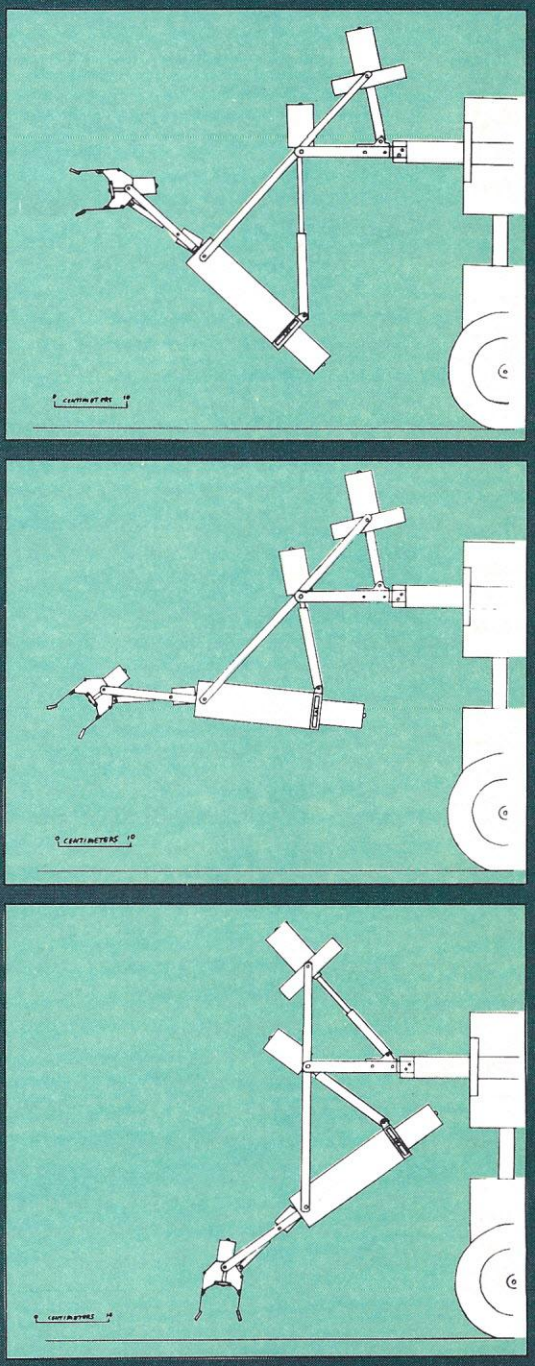
"All the dealers we've been talking to have intentions of selling our GRIVETs with their own intelligence. There will be a lot of work out there developing feedback systems and promotions of a more complete product. Most of the people that have purchased units have indicated to us that they are using them for their own research in the fields of artificial intelligence and robotic design. They are not particularly interested in practical applications. We are waiting to hear from those others who are developing practical uses for the GRIVET – apart from the research.

"Our price is not elastic the way computer prices are. You remember when the Altair system first came out they established a standard and almost every month after that there were 2 or 3 additions to the market place of products from new companies. For a year's period more than 170 new computer companies were established based on second sourcing or modular substitution into a standard bus. Over 170 companies supporting one man's concept in the computer!

"Now we could sell these GRIVETs assembled with computers and programmed to do practical tasks or be useable in the labs for experimental application and artificial research. But if we did that, then we would not leave open the market for generating interest in individual effort and promoting new businesses supporting our product. What we elected to do was bring the cost down. Strip the product clean of everything but essentials as far as operations of the robot is concerned and leave nothing on the robot to indicate that any particular microcomputer or particular feedback systems were required to operate it. It's a total, across-the-board stripped-down, no-nonsense robot! Anyone who has any idea about what they want to do with it, or what they can do with it, can build up a new business supplying our kit builders with products required to interface it, to make it more intelligent, more attractive – like giving it a head.

"There is no particular single computer required for the GRIVET. Because we are the only ones selling anything like this this year, you can pretty well expect it to be a standard for related new products coming out. The spin-off. In other words, in 1978, anybody writing programs in any language for any microcomputer using any interface for a robot kit recently purchased – then you know it's got to be for the GRIVET."

John anticipates that there will be a $10,000,000 annual market for the little rascal as its potentials become apparent to owners. Current prices for the GRIVET or its parts are $399 for the Arm Module Kit; $79.95 for the Torso Module Kit; $275 for the Base Module Kit or $989 for the Complete GRIVET Kit. To this must be added shipping charges and sales tax if applicable. For more information write to Gallagher Research, Inc., PO Box 10767, Winston-Salem, NC 27108. Or give 'em a call at (919) 748-8761. And may the Force be With You! □



The three diagrams above depict the result of combining the actions of the upper arm motor with the one at the elbow. The upper motor provides more lift, while the lower one is used for trimming. However, both movements are swift, with full travel under 2 seconds.

The wrist rotates 180° like the shoulder. This motor permits pouring, because it does not have the load on the shoulder motor. The mid-position of both cylinders is downward.

The hand motor tilts the fingers 45° downward. This tilting, combined with the elbow movement, achieves a 90° angle with respect to the floor. However, this smaller motor does not have the strength the elbow motor has.

The Computer Checks Into the Balancing Act

BY O. E. DIAL

Part II

This Check Register Accounting System provides a complete accounting system for home or small business – or both, if you're self-employed. A single transaction entry produces a number of special outputs, saving you time, money and headaches each month – and at tax time Part I of the CRAS *system appeared in* Personal Computing, *August 1978.*

CRAS is a fully integrated accounting system that requires neither accounting expertise nor knowledge of computers. The Transaction Entry Program creates a data base which the computer draws on to prepare a variety of statements serving many purposes. This article discusses four such statements. For a fuller understanding of the CRAS system, you should review Part I of this series (August *PC*).

Though similar, the Business Accounts Distributions (CRAS-BAD) and Personal Accounts Distributions (CRAS-PAD) Programs differ in that CRAS-BAD summarizes activity in business accounts #10 through #25; CRAS-PAD does the same for personal accounts, #26 through #45.

You'll find the distribution statements useful for self-auditing – finding errors where an entry is charged to the wrong account. But the statements also provide at a glance an understanding of how money is spent or earned.

The statements are available in one-month lengths. After selecting the statements option in the CRAS-RS program, you only need to stipulate the number of the month for which you want a statement.

CRAS-BAD requires 5666 bytes of core memory and CRAS-PAD 5687 (passive state). They may be called directly from disk or via the CRAS-RS program. Upon run completion, program control returns to CRAS-RS.

To spread 17 columns across the page, each entry's decimal portion had to be sacrificed. Rounding each amount to an integer explains minor variations in the addition of certain columns. To prevent accumulation of error, the original entry, including the the decimal portion, is used for accumulation purposes.

Little in the programs has not been discussed in Part I of this series. Only one portion of the program requires explanation. A field of 122 characters is reserved on file #9 for the names of the checking account and the bank. Not all of these are used, and since the data is Right Set in the disk record, the unused portion will be represented as nulls.

To use these titles in automatic centering routines, the nulls must be stripped away. Lines 320 to 350 serve this function. A title of 122 characters in length is obtained from disk. The routine strips away the nulls or blanks, one at a time, preceding the title. When the first non-null is read, the string is redefined as consisting of that character together with the remaining characters. Obtaining this string's length then makes possible centering the string for use as a title.

Statements of Accounts

Statements of Accounts is perhaps the most valuable program in CRAS, particularly for preparing income tax returns. At various times of the year, you'll want a report of all transactions affecting the "Equipment Account", "Savings" or whatever accounts you define. You may reach CRAS-SOA either directly on disk or via the CRAS-RS; in any event, program control returns to CRAS-RS after each run of CRAS-SOA. CRAS-SOA requires 8023 bytes of core in a passive state.

In the short dialogue that precedes preparing the statement, you indicate whether you want a statement for every account (as would be required at year end) or for selected accounts. If the latter, state the account number, then the number of the first and last month of the report. The report may be for any multiple of a month.

Lines 2280 through 2330 provide an error detection routine in which you input the number of a later month than the one you have transactions on file for. In this instance, the program substitutes the last month transactions are on file for as the ending month of the report.

When a report exceeds one page in length, the program prints a summary title on the second page. The program keeps a line and page count, and with the PRINT CHR$(12) statement advances to a new page at the appropriate time. The number of lines printed per page may be adjusted in lines 1460 and 1750.

Checking account reconciliation statement

You may call CRAS-CAR directly or via CRAS-RS. The program requires 8935 bytes of core memory, but as with the remaining programs, the byte count can be dramatically reduced by the economies suggested in Part I.

Should you desire a statement, its short dialogue precedes printing. Since the program is frequently called for, although not all bank charges have been entered as transactions, a reminder is provided at the outset. You are then given the option of returning to CRAS-TE to enter additional transactions. Probably the most frequent reason for using this circuitous route is failure to record bank service charges.

Should you find two or three unbroken series of transactions to clear, your best bet is using the SEQUENCE routines. Input the first and last transaction number of each series. When you're finished with the SEQUENCE routine, input the transaction number

of isolated transactions which have cleared. Finally, input a zero.
lated transactions which have cleared. Finally, input a zero.

The program then finds the highest transaction number in an unbroken series and files this number, which will prevent redundant searches through all transactions to find if they've cleared. Where a statement is produced in the second half of the program, the number just filed becomes the starting point for reviewing remaining transactions to see if they've cleared.

If you want a statement, input the bank statement closing date and closing balance. The statement is then produced.

Listing uncleared transactions provides useful information, particularly where ancient transactions not yet cleared are uncovered. You may want to place a stop order on the check and reverse the transaction with a memo entry (See Part I for a discussion of Memo Entries). If the accounts don't reconcile, the listing can easily reveal the error.

Transaction number, rather than check number, is the key to clearing transactions. This procedure may seem odd, but many transactions, including deposits, memo entries and bank charges, will not be associated with a check number.

Part III

Three more programs are in the CRAS System. The first, CRAS-SF, permits constructing, editing, adding and deleting up to ten suspense file items per month. The program sorts each item into chronological order.

The second, CRAS-CP, prints checks. The program converts digits to words. Simple in concept, this portion of the program is actually quite complex.

To prevent inadvertent damage to the files, the third program must be called direct; it cannot be reached via CRAS-RS. CRAS-TF transfers selected files and account balances from an old disk to a new one so that CRAS may continue throughout the year independent of record volumes.

My "Recursive Budgeting" model (*PC*, May/June 1977) will be integrated into CRAS. Tying "Recursive Budgeting" to CRAS permits periodic reports comparing budgeted to actual income and expenses, together with an adjusted budget spread over the remaining months of the budget period.

Part III of CRAS and "Recursive Budgeting" will appear in future issues of *Personal Computing*. □

(Note: All names and data used to illustrate the CRAS system are fictitious; any coincidence of names with real persons is accidental.)

CRAS (PROGRAM 6) – SAMPLE RUN

```
RUN"CRAS-BAD
   * * BUSINESS ACCOUNTS DISTRIBUTIONS STATEMENT * *

WHAT IS THE NUMBER OF THE MONTH? 7
```

BUSINESS INCOME AND EXPENSE DISTRIBUTIONS STATEMENT FOR JULY, 1978

O. E. AND BETTE J. DIAL (50-17741) / FIRST NATIONAL BANK AT BOULDER

TXN	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
BAL	1242	81	0	2	0	51	0	253	0	106	0	26	21	0	0	1000
215	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
216	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
217	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
218	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
219	0	0	0	0	0	51	0	0	0	0	0	0	0	0	0	0
220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
221	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
222	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
223	0	9	0	0	0	0	0	0	0	21	0	0	0	0	0	0
224	1030	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
225	0	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0
226	0	0	0	0	0	0	0	238	0	0	0	0	0	0	0	0
227	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
228	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0
229	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
230	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0
231	0	0	0	0	0	0	0	21	0	44	0	0	0	0	0	0
232	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
233	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
234	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
235	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
236	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
237	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
238	720	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
239	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOT	2992	142	0	11	0	101	0	512	0	170	0	31	21	0	0	1000

CRAS (PROGRAM 6) – LISTING

```
10 '    ************************************************************************************************************************
20 '    *                                                                                                                      *
30 '    *                    CRAS (PROGRAM 6): CHECK REGISTER ACCOUNTING SYSTEM - O. E. DIAL   1978                            *
40 '    *                                                                                                                      *
50 '    ************************************************************************************************************************
60 '
70 '
```

```
80 '    ************************************************
90 '    *
100 '   *       CRAS-BAD: BUSINESS ACCOUNTS DISTRIBUTIONS
110 '   *
120 '   ************************************************
130 '
140 CLEAR 2500: WIDTH 132'      * * NOTE THAT A PRINTER WIDTH OF 132 CHARACTERS IS REQUIRED FOR STATEMENTS.
150 DEFINT I-S
160 CLOSE: Q=0'                 * * TO INITIALIZE THE TRANSACTION NUMBER
170 W4$="| #####-"'             * * FORMAT FOR ACCOUNT BALANCES
180 W6$="###"'                  * * FORMAT FOR ACCOUNT ENTRIES
190 '
200 DATA JANUARY, FEBRUARY, MARCH, APRIL, MAY, JUNE, JULY, AUGUST, SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER
210 DIM M$(12), AB(16), AE(16), G1$(16), G2$(16)
212 '
220 FOR I=1 TO 12
230     READ M$(I)'             * * READ THE CALENDAR
240 NEXT I
250 GOTO 740
260 '
270 '           * * * FILING SUBROUTINES
280 '
290 FIELD #9, 2 AS IM$, 4 AS RY$, 122 AS NM$'   * * GET NAME, BANK, AND YEAR DATA
300 GET #9, 1
310 IM=CVI(IM$): YR$=RY$: B$=NM$
320 FOR J1=1 TO 126
330     IF MID$(B$, J1, 1)=" " THEN 350'        * * STRIP AWAY THE NULLS ON THE TITLES
340     GOTO 360
350 NEXT J1
360 B$=MID$(B$, J1)
370 '
380 FIELD #7, 126 AS D$, 2 AS Q$
390 GET #7, M
400 Q = CVI(Q$)'                * * ENDING TRANSACTION NUMBER FOR THE MONTH
402 '
410 FIELD #8, 2 AS M1$, 2 AS Q1$, 2 AS QM$, 2 AS QJ$, 120 AS DU$
420 GET #8, 1
430 Q1=CVI(Q1$): M1=CVI(M1$)'   * * LAST MONTH AND LAST TRANSACTION NUMBER
440 RETURN
450 '
460 FOR I = 1 TO 16'           * * GET THE ACCOUNTS OPENING BALANCES, BY MONTH
470     FIELD #5, 64 AS I1$, (I-1) * 4 AS I2$, 4 AS G2$(I)
480 NEXT I
490 GET #5, M
540 FOR I = 1 TO 16
550     AB(I)=CVS(G2$(I))'      * * CONVERT STRINGS TO SINGLE PRECISION NUMBERS
560 NEXT I
570 RETURN
580 '
590 FOR I = 1 TO 16'           * * GET THE ACCOUNTS ENTRIES, BY MONTH
600     FIELD #2, 64 AS I1$, (I-1) * 4 AS I2$, 4 AS G1$(I)
610 NEXT I
620 GET #2, J
670 FOR I =1 TO 16
680     AE(I)=CVS(G1$(I))'      * * CONVERT STRINGS TO SINGLE PRECISION NUMBERS
690 NEXT I
700 RETURN
710 '
720 '           * * * PROGRAM CONTINUATION
730 '
740 PRINT TAB(3) "* * BUSINESS ACCOUNTS DISTRIBUTIONS STATEMENT * *": PRINT: PRINT
750 INPUT "WHAT IS THE NUMBER OF THE MONTH"; M: PRINT
760 GOSUB 1530'                 * * OPEN THE FILES
770 GOSUB 1460'                 * * TEST FOR CORRECT MONTH
780 GOSUB 1620'                 * * FORM THE DATE STRING
790 GOSUB 1650'                 * * SHIFT I/O PORTS TO THE PRINTER
800 GOSUB 1160'                 * * PRINT A DOUBLE UNDERSCORE
810 GOSUB 1350'                 * * FORM AND PRINT THE TITLE STRING
820 GOSUB 1250'                 * * FORM AND PRINT THE SUBTITLE STRING
830 GOSUB 1190'                 * * PRINT A SINGLE UNDERSCORE
840 GOSUB 1300'                 * * PRINT COLUMN CAPTIONS (ACCOUNT NUMBERS)
850 GOSUB 460'                  * * GET THE OPENING BALANCES
860 GOSUB 1070'                 * * PRINT THE OPENING BALNCES
870 GOSUB 1400'                 * * GET THE BEGINNING AND ENDING TRANSACTION NUMBERS FOR THE MONTH
880 '
890 FOR J = P TO Q
900     GOSUB 590'              * * GET THE ACCOUNT ENTRIES FOR THE MONTH
910     GOSUB 1100'             * * PRINT THE ACCOUNT ENTRIES
920 NEXT J
930 '
940 GOSUB 1320'                 * * PRINT A BROKEN UNDERSCORE
950 '
980 GOSUB 1130: PRINT'          * * PRINT THE CLOSING BALANCES
990 GOSUB 1160'                 * * PRINT A DOUBLE UNDERSCORE
1000 CONSOLE 16,0'              * * SHIFT PORTS TO THE CRT
1010 CLOSE
1020 '
1030 RUN "CRAS-RS"
1040 '
1050 '          * * * VARIOUS SUBROUTINES
1060 '
1070 PRINT "BAL";: FOR K = 1 TO 16: PRINT USING W4$; AB(K);: NEXT K: PRINT'             * * PRINTS OPENING BALANCES
1080 RETURN
1090 '
1100 PRINT USING W6$; J;: FOR K = 1 TO 16: PRINT USING W4$; AE(K);: AB(K)=AB(K)+AE(K): NEXT K: PRINT'   * * PRINT ACCOUNT ENTRIES
1110 RETURN
1120 '
1130 PRINT "TOT";: FOR K = 1 TO 16: PRINT USING W4$; AB(K);: NEXT K: PRINT'             * * PRINT CLOSING BALANCES
1140 RETURN
1150 '
1160 FORJ2=1TO131:PRINT"=";:NEXTJ2:PRINT: PRINT'        * * PRINT A DOUBLE UNDERSCORE
1170 RETURN
1180 '
1190 FORJ2=1TO131:PRINT"-";:NEXTJ2:PRINT'               * * PRINT A SINGLE UNDERSCORE
1200 RETURN
1210 '
1220 PRINT TAB(INT((132-LEN(Y$))/2)) Y$: PRINT'         * * CENTER AND PRINT THE TITLE
1230 RETURN
1240 '
1250 S=INT((132-LEN(B$))/2)'                            * * CALCULATE THE TAB
```

CRAS (PROGRAM 6) – CONTINUED

```
1260 PRINT TAB(S) B$: PRINT
1270 RETURN
1280 '
1290 '                                                  * * PRINT COLUMN HEADINGS
1300 PRINT"TXN|   10  |   11  |   12  |   13  |   14  |   15  |   16  |   17  |   18  |   19  |   20  |   21  |   22  |   23  |   24
  |   25  "
1310 '
1320 PRINT "---|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----
---|--------"
1330 RETURN
1340 '
1350 Y$= "BUSINESS INCOME AND EXPENSE DISTRIBUTIONS STATEMENT FOR " + TD$'      * * FORM THE TITLE STRING
1360 GOSUB 1220'                                        * * PRINT THE TITLE STRING
1370 RETURN
1380 '
1390 '                                                  * * GET THE FIRST AND LAST TRANSACTION NUMBERS FOR THE MONTH
1400  IF M=IM THEN P=1: GOTO 1430
1410 M=M-1
1420 GOSUB 380: P=Q+1: M=M+1
1430 GOSUB 380
1440 RETURN
1450 '
1460 GOSUB 410: GOSUB 290: IF M=IM THEN 1510'           * * TEST FOR CORRECT MONTH
1470 IF M<=M1 THEN 1510
1480 PRINT "THE LAST MONTH FOR WHICH YOU HAVE ENTERED TRANSACTIONS IS"
1490 PRINT M$(M1)".  WE HAVE SUBSTITUTED THIS AS THE MONTH OF THE STATEMENT"
1500 PRINT "YOU WANT.": PRINT: M=M1
1510 RETURN
1520 '
1530 OPEN "R", 2, "BT-ACEN1"
1550 OPEN "R", 5, "BT-ACAB1"
1570 OPEN "R", 7, "BT-TMTN1"
1580 OPEN "R", 8, "BT-LMLT1"
1590 OPEN "R", 9, "BT-INIT1"
1600 RETURN
1610 '
1620 TD$=M$(M) + ", " + YR$'                            * * FORM THE DATE STRING
1630 RETURN
1640 '
1650 CONSOLE 18,0'              * * SHIFT PORTS TO THE PRINTER
1660    PRINT CHR$(7)'          * * SOUND THE BELL
1670    PRINT CHR$(12)'         * * ADVANCE THE PAPER TO 'TOP OF FORM'
1680    CONSOLE 16,0'           * * SHIFT PORTS TO THE CRT
1690    INPUT "PAPER POSITIONED"; Y$: PRINT
1700    CONSOLE 18,0'           * * BACK TO THE PRINTER
1710 RETURN
OK
```

CRAS (PROGRAM 7) – LISTING

```
10 '    ************************************************************************************************************************
20 '    *                                                                                                                      *
30 '    *                    CRAS (PROGRAM 7): CHECK REGISTER ACCOUNTING SYSTEM - O. E. DIAL   1978                            *
40 '    *                                                                                                                      *
50 '    ************************************************************************************************************************
60 '
70 '
80 '    ************************************************
90 '    *
100 '   *       CRAS-PAD: PERSONAL ACCOUNTS DISTRIBUTIONS
110 '   *
120 '   ************************************************
130 '
140 CLEAR 2500: WIDTH 132
150 DEFINT I-T
160 CLOSE: Q=0
170 W5$="|#####-"'              * * PRINT USING FORMAT FOR ACCOUNT ENTRIES
180 W6$="###"'                  * * PRINT USING FORMAT FOR TRANSACTION NUMBER
190 W7$="|####-"'               * * PRINT USING FORMAT FOR SELECTED ACCOUNTS
200 '
210 DATA JANUARY, FEBRUARY, MARCH, APRIL, MAY, JUNE, JULY, AUGUST, SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER
220 DIM M$(12), AB(39), AE(39), G1$(39), G2$(39)
230 '
240 FOR I=1 TO 12
250     READ M$(I)'             * * READ THE CALENDAR
260 NEXT I
270 '
280 GOTO 750
290 '
300 '           * * * FILING SUBROUTINES
310 '
320 FIELD #9, 2 AS IM$, 4 AS RY$, 122 AS NM$'   * * GET NAME, BANK, AND YEAR DATA
330 GET #9, 1
340 IM=CVI(IM$): YR$=RY$: B$=NM$
350 '
360 FOR J1=1 TO 126
370     IF MID$(B$, J1, 1)=" " THEN 390'        * * STRIP AWAY THE NULLS
380     GOTO 400
390 NEXT J1
400 B$=MID$(B$, J1)
410 RETURN
420 '
430 FIELD #7, 126 AS D$, 2 AS Q$'               * * GET THE ENDING TRANSACTION NUMBER
440 GET #7, M
450 Q = CVI(Q$)
460 '
470 FIELD #8, 2 AS M1$, 2 AS Q1$, 2 AS QM$, 2 AS QJ$, 120 AS DU$
480 GET #8, 1'                                  * * LAST MONTH AND LAST TRANSACTION NUMBER
```

```
490 Q1=CVI(Q1$): M1=CVI(M1$): QM=CVI(QM$): QJ=CVI(QJ$)
500 RETURN
510 '
520 FOR I = 17 TO 39'                          * * GET ACCOUNT BALANCES
530     FIELD #6, 36 AS I1$, (I-17) * 4 AS I2$, 4 AS G2$(I)
540 NEXT I
550 GET #6, M
560 '
570 FOR I = 17 TO 39
580     AB(I)=CVS(G2$(I))'                     * * CONVERT STRINGS TO SINGLE PRECISION NUMBERS
590 NEXT I
600 RETURN
610 '
620 FOR I = 17 TO 39'                          * * GET THE ACCOUNT ENTRIES
630     FIELD #3, 36 AS I1$, (I-17) * 4 AS I2$, 4 AS G1$(I)
640 NEXT I
650 '
660 GET #3, J
670 FOR I =17 TO 39
680     AE(I)=CVS(G1$(I))'                     * * CONVERT STRINGS TO SINGLE PRECISION NUMBERS
690 NEXT I
700 RETURN
710 '
720 '
730 '           * * * PROGRAM CONTINUATION
740 '
750 PRINT CHR$(12)'     * * TO CLEAR THE SCREEN
760 PRINT TAB(3) "* * PERSONAL ACCOUNTS DISTRIBUTIONS STATEMENT * *": PRINT: PRINT
770 INPUT "WHAT IS THE NUMBER OF THE MONTH"; M: PRINT
780 '
790 GOSUB 1620'         * * TO OPEN THE FILES
800 GOSUB 1550'         * * TEST FOR CORRECT MONTH
810 GOSUB 1690'         * * FORM THE DATE STRING
820 GOSUB 1720'         * * SHIFT I/O PORTS TO THE PRINTER
830 GOSUB 1230'         * * PRINT A DOUBLE UNDERSCORE
840 GOSUB 1390'         * * FORM AND PRINT THE TITLE STRING
850 GOSUB 1340'         * * FORM AND PRINT THE SUBTITLE STRING
860 GOSUB 1270'         * * PRINT A SINGLE UNDERSCORE
870 GOSUB 1440'         * * PRINT COLUMN CAPTIONS (ACCOUNT NUMBERS)
880 GOSUB 520'          * * GET THE OPENING BALANCES
890 GOSUB 1080'         * * PRINT THE OPENING BALANCES
900 GOSUB 1480'         * * GET THE FIRST AND LAST TRANSACTION NUMBERS
910 '
920 FOR J = P TO Q
930     GOSUB 620'      * * GET THE ACCOUNT ENTRIES
940     GOSUB 1130'     * * PRINT THE ACCOUNT ENTRIES
950 NEXT J
960 '
970 GOSUB 1450'         * * PRINT A BROKEN UNDERSCORE
980 GOSUB 1180'         * * PRINT THE CLOSING BALANCES
990 GOSUB 1230'         * * PRINT A DOUBLE UNDERSCORE
1000 CONSOLE 16,0'      * * SHIFT PORTS TO THE CRT
1010 CLOSE
1020 '
1030 RUN "CRAS-RS"
1040 '
1050 '          * * * VARIOUS SUBROUTINES
1060 '
1070 '                                  * * PRINT ACCOUNT BALANCES
1080 PRINT "BAL";: FOR K = 17 TO 30: PRINT USING W7$; AB(K);: NEXT K
1090     FOR K = 31 TO 36: PRINT USING W5$; AB(K);: NEXT K: PRINT
1100 RETURN
1110 '
1120 '                                  * * PRINT ACCOUNT ENTRIES
1130 PRINT USING W6$;J;: FOR K = 17 TO 30: PRINT USING W7$; AE(K);: AB(K)=AB(K)+AE(K):  NEXT K
1140     FOR K = 31 TO 36: PRINT USING W5$; AE(K);: AB(K)=AB(K)+AE(K): NEXT K: PRINT
1150 RETURN
1160 '
1170 '                                  * * PRINT CLOSING BALANCES
1180 PRINT "TOT";: FOR K = 17 TO 30: PRINT USING W7$; AB(K);: NEXT K
1190     FOR K = 31 TO 36: PRINT USING W5$; AB(K);: NEXT K: PRINT
1200 RETURN
1210 '
1220 '                                  * * PRINT A DOUBLE UNDERSCORE
1230 FORJ2=1TO129:PRINT"=";:NEXTJ2:PRINT: PRINT
1240 RETURN
1250 '
1260 '                                  * * PRINT A SINGLE UNDERSCORE
1270 FORJ2=1TO129:PRINT"-";:NEXTJ2:PRINT
1280 RETURN
1290 '
1300 '                                  * * TAB AND PRINT A STRING
1310 PRINT TAB(INT((132-LEN(Y$))/2)) Y$: PRINT
1320 RETURN
1330 '
1340 S=INT((132-LEN(B$))/2)'            * * CALCULATE A TAB
1350 PRINT TAB(S) B$: PRINT
1360 RETURN
1370 '
1380 '                                  * * FORM A TITLE STRING
1390 Y$= "PERSONAL INCOME AND EXPENSE DISTRIBUTIONS FOR " + TD$
1400 GOSUB 1310'                        * * PRINT THE TITLE
1410 RETURN
1420 '
1430 '                                  * * PRINT THE COLUMN CAPTIONS
1440  PRINT"NO |  26 |  27 |  28 |  29 |  30 |  31 |  32 |  33 |  34 |  35 |  36 |  37 |  38 |  39 |  40  |  41  |  42  |  43  |  44
  |  45"
1450 PRINT "---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|----
--|------"
1460 RETURN
1470 '
1480 IF M=IM THEN P=1: GOTO 1510'       * * GET THE FIRST AND LAST TRANSACTION NUMBERS
1490 M=M-1
1500 GOSUB 430: P=Q+1: M=M+1
1510 GOSUB 430
1520 RETURN
1530 '
1540 '
```

CRAS (PROGRAM 7) - CONTINUED

```
1550 GOSUB 470: GOSUB 320: IF M=IM THEN 1600
1560 IF M<=M1 THEN 1600
1570 PRINT "THE LAST MONTH FOR WHICH YOU HAVE ENTERED TRANSACTIONS IS"
1580 PRINT M$(M1)".  WE HAVE SUBSTITUTED THIS AS THE MONTH OF THE STATEMENT"
1590 PRINT "YOU WANT.": PRINT: M=M1
1600 RETURN
1610 '
1620 OPEN "R", 3, "BT-ACEN2"
1630 OPEN "R", 6, "BT-ACAB2"
1640 OPEN "R", 7, "BT-TMTN1"
1650 OPEN "R", 8, "BT-LMLT1"
1660 OPEN "R", 9, "BT-INIT1"
1670 RETURN
1680 '
1690 TD$=M$(M) + ", " + YR$'     * * FORM THE DATE STRING
1700 RETURN
1710 '
1720 CONSOLE 18,0
1730    PRINT CHR$(7)'           * * RING THE BELL
1740    PRINT CHR$(12)'          * * MOVE THE PAPER TO 'TOP OF FORM'
1750    CONSOLE 16,0'            * * SHIFT TO THE CRT PORT
1760    INPUT "PAPER POSITIONED"; Y$: PRINT
1770    CONSOLE 18, 0'           * * SHIFT TO THE PRINTER PORT
1780 RETURN
OK
```

CRAS (PROGRAM 8) - SAMPLE RUN

```
   * * STATEMENTS OF ACCOUNTS * *

DO YOU WANT A STATEMENT OF EACH ACCOUNT? N

PLEASE ENTER THE NUMBER OF THE ACCOUNT? 10

WHAT IS THE NUMBER OF THE FIRST MONTH OF THE REPORT? 1

WHAT IS THE NUMBER OF THE LAST MONTH OF THE REPORT? 7

==========================================================================================================

                    STATEMENT OF ACCOUNT NO. 10 -- ELECTRONIC EQUIPMENT

                          FOR JANUARY THROUGH JULY, 1978

                O. E. AND BETTE J. DIAL (50-17741) / FIRST NATIONAL BANK AT BOULDER

--------------------------------------------------------------------------------------------------------
TXN|MO|DA|        PAYEE/PAYOR          |        IN PAYMENT OF        |CHK#|   AMOUNT   |  SUBTOTAL  |    NOTE (May be truncated)
---|--|--|------------------------------|-----------------------------|----|------------|------------|-------------------------------
 OPENING BALANCE                                                                |            |        0.00|
 91| 3| 1| MASTER CHARGE                | ACCOUNT BALANCE             | 410|     303.52|      303.52| UNINSURED CASUALTY LOSS PORT
105| 3|14| MCSC                         | TEC KIT 100 CRT             | 424|     765.00|    1,068.52| SEE TXN 126.  MADE AN ERROR
106| 3|24| MCSC                         | SOLD OLD VIDEO TERMINAL     |    |    -400.00|      668.52|
134| 4| 4| MASTER CHARGE                | ACCT#51421515 0013974       |1019|     551.47|    1,219.99| EQUIPMENT--NEW ROM BOARD; CA
174| 5|12| DELPHI COMPUTER CENTER       | REPLACE DISK DRIVE UNIT     |1041|     100.00|    1,319.99|
198| 6| 5| VISA                         |                             |1047|     141.62|    1,461.61| ITEM #05981 IS FOR SPECIAL C
204| 6|12| MCSC                         | ON ACCOUNT                  |1052|   1,000.00|    2,461.61| TOWARD PURCHASE OF HORIZON M
224| 7| 7| DELPHI COMPUTER CENTER       | DUAL DISK DRIVES            |1056|   1,029.83|    3,491.44| TRADED IN SINGLE DISK DRIVE
238| 7|15| MCSC                         | BALANCE OF ACCOUNT          |1067|     720.40|    4,211.84| BALANCE OF NORTHSTAR COMPUTE

==========================================================================================================
```

CRAS (PROGRAM 8) - LISTING

```
10 '    ***************************************************************************************************
20 '    *                                                                                                 *
30 '    *                    CRAS (PROGRAM 8): CHECK REGISTER ACCOUNTING SYSTEM - O. E. DIAL   1978                *
40 '    *                                                                                                 *
50 '    ***************************************************************************************************
60 '
70 '
80 '    ************************************************
90 '    *
100 '   *       CRAS-SOA: STATEMENTS OF ACCOUNTS
110 '   *
120 '   ************************************************
130 '
140 CLEAR 2500: WIDTH 132
150 DEFINT I-T
160 CLOSE: Q=0: QN=0
170 WA$=   "###|##|\\| \                    \ | \                    \ |\  \|  ###,###.##|  ###,###.##| \

        \ "
180 WF$="|              |  ###,###.##|"
190 '
200 DATA JANUARY, FEBRUARY, MARCH, APRIL, MAY, JUNE, JULY, AUGUST, SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER
210 DIM M$(12), AB(39), AE(39), G1$(39), G2$(39), AC$(36), NA$(6), AD$(6)
220 '
230 FOR I=1 TO 12
240     READ M$(I)'              * * READ THE CALENDAR
250 NEXT I
260 '
270 GOTO1110
```

```
280 '           * * * FILING SUBROUTINES
290 '
300 OPEN "R", 9, "BT-INIT1"'     * * GET THE NAME, BANK, AND YEAR DATA
310 FIELD #9, 2 AS IM$, 4 AS RY$, 122 AS NM$
320 GET #9, 1
330 IM=CVI(IM$): YR$=RY$: B$=NM$
340 CLOSE
350 FOR J=1 TO 122'              * * STRIP THE NULLS FROM THE NAME/BANK STRING
360     IF MID$((B$),J,1)<>" " THEN 380
370 NEXT J
380 B$=MID$((B$),J)
390 '
400 OPEN "R", 10, "BT-INIT2"'    * * GET THE NAME OF EACH ACCOUNT IN THE SYSTEM
410 FOR J = 1 TO 6
420     FOR K = 1 TO 6
430             FIELD #10, 2 AS D1$, (K-1) * 21 AS D2$, 21 AS AD$(K)
440     NEXT K
450     GET #10, J
460     FOR K = 1 TO 6'          * * STRIP OF THE NULLS FROM THE TITLES
470             FOR J1 = 1 TO 21
480                     IF MID$(AD$(K), J1, 1)=" " THEN 500
490                     GOTO 510
500             NEXT J1
510             AC$(K-6+(J*6))=MID$(AD$(K), J1)
520     NEXT K
530 NEXT J
540 CLOSE
550 RETURN
560 '
570 OPEN "R", 7, "BT-TMTN1"'     * * GET THE LAST TRANSACTION NUMBER IN THE MONTH
580 FIELD #7, 126 AS D$, 2 AS Q$
590 GET #7, M
600 CLOSE 7
610 Q = CVI(Q$)
620 RETURN
630 '
640 OPEN "R", 8, "BT-LMLT1"'     * * GET THE LAST TRANSACTION NUMBER IN THE LAST MONTH
650 FIELD #8, 2 AS M1$, 2 AS Q1$, 2 AS QM$, 2 AS QJ$, 120 AS DU$
660 GET #8, 1
670 Q1=CVI(Q1$): M1=CVI(M1$): QM=CVI(QM$): QJ=CVI(QJ$)
680 CLOSE 8
690 RETURN
700 '
710 OPEN "R", 5, "BT-ACAB1"'     * * GET ACCOUNT BALANCES FOR BUSINESS ACCOUNTS
720 FOR I = 1 TO 16
730     FIELD #5, 64 AS I1$, (I-1) * 4 AS I2$, 4 AS G2$(I)
740 NEXT I
750 GET #5, M
760 CLOSE
770 I3=1: I4=16
780 GOTO 880
790 '
800 OPEN "R", 6, "BT-ACAB2"'     * * GET ACCOUNT BALANCES FOR PERSONAL ACCOUNTS
810 FOR I = 17 TO 39
820     FIELD #6, 36 AS I1$, (I-17) * 4 AS I2$, 4 AS G2$(I)
830 NEXT I
840 GET #6, M
850 CLOSE
860 I3=17: I4=39
870 '
880 FOR I = I3 TO I4
890     AB(I)=CVS(G2$(I))'       * * CONVERT THE STRINGS TO SINGLE PRECISION NUMBERS
900 NEXT I
910 RETURN
920 '
930 '                            * * THE TRANSACTION RECORDS POINT TO THE NOTE RECORD NUMBERS
940 FIELD #1, 2 AS FM$, 2 AS F1$, 1 AS F2$, 1 AS FX$, 1 AS F4$, 30 AS F5$, 30 AS F6$, 4 AS F7$, 2 AS F9$, 4 AS FA$, 1 AS FB$, 50 AS
DU$
950 GET #1,  J
960 A1=CVS(FA$): MM=CVI(FM$): QN=CVI(F9$): A1$=F1$: A7$=F7$: A2$=F2$: X$=FX$: A4$=F4$: A5$=F5$: A6$=F6$: K6$=FB$
970 RETURN
980 '
990 '
1000 FIELD #4, 128 AS F8$
1010 GET #4, QN: A8$=F8$
1020 FOR I = 1 TO 128
1030     IF MID$(A8$, I, 1)=" " THEN 1050
1040     A8$=MID$(A8$, I): GOTO 1060
1050 NEXT I
1060 RETURN
1070 '
1080 '
1090 '           * * * PROGRAM CONTINUATION
1100 '
1110 PRINT CHR$(12)'             * * TO CLEAR THE SCREEN
1120 PRINT TAB(3) "* * STATEMENTS OF ACCOUNTS * *": PRINT: PRINT
1130 GOSUB 400'                  * * GET THE ACCOUNT TITLES
1140 INPUT "DO YOU WANT A STATEMENT OF EACH ACCOUNT"; Y$: PRINT
1150 IF LEFT$(Y$,1)="Y" THEN J5=1: GOTO 1190
1160 INPUT "PLEASE ENTER THE NUMBER OF THE ACCOUNT"; R: R=R-9: PRINT
1170 IF R<1 OR R>36 THEN 1180 ELSE 1190
1180     PRINT "YOU HAVE NO ACCOUNT BY THAT NUMBER.": PRINT: GOTO 1160
1190 INPUT "WHAT IS THE NUMBER OF THE FIRST MONTH OF THE REPORT"; N: PRINT
1200 INPUT "WHAT IS THE NUMBER OF THE LAST MONTH OF THE REPORT"; O: PRINT: M=O
1210 GOSUB 2280'                         * * CHECK FOR THE CORRECT MONTH
1220 GOSUB 2350'                         * * SHIFT PORTS TO THE PRINTER
1230 IF J5=1 THEN 1280
1240             GOSUB 1340'     * * PRINTS HEADINGS AND OPENING BALANCE
1250             GOSUB 1460'     * * PRINTS ACCOUNT ENTRIES
1260             GOTO 1840
1270
1280     FOR R=1 TO 36
1290             GOSUB 1340'     * * PRINTS HEADINGS AND OPENING BALANCE
1300             GOSUB 1460'     * * PRINTS ACCOUNT ENTRIES
1310     NEXT R
1320     CONSOLE 16,0
1330     GOTO 1870
1340 GOSUB 1930'                 * * PRINT A DOUBLE UNDERSCORE
1350 GOSUB 2040'                 * * PRINT THE STATEMENT TITLE AND PERIOD
```

CRAS (PROGRAM 8) – CONTINUED

```
1360 GOSUB 1990'                * * PRINT THE NAME OF THE ACCOUNT
1370 GOSUB 1960'                * * PRINT A SINGLE UNDERSCORE
1380 GOSUB 2100'                * * PRINT COLUMN HEADS AND A BROKEN UNDERSCORE
1390 CLOSE
1400 M=N'                       * * SET 'M' TO THE FIRST MONTH OF THE REPORT
1410 IF R<17 THEN GOSUB 710 ELSE GOSUB 800'       * * GET THE OPENING BALANCE
1420 GOSUB 2190'                * * PRINT THE OPENING BALANCE
1430 AT=0: AT=AT+AB(R)
1440 RETURN
1450 '
1460 LP=1: LN=50
1470 IF R<17 THEN OPEN "R", 2, "BT-ACEN1" ELSE OPEN "R", 3, "BT-ACEN2"
1480 OPEN "R", 1, "BT-TRAN1"
1490 OPEN "R", 4, "BT-NOTE1"
1500 FOR M=N TO O
1510    GOSUB 2220'             * * GET THE FIRST TRANSACTION NUMBER FOR THE REPORT PERIOD
1520    FOR J=P TO Q
1530            IF R>16 THEN 1580
1540                    FIELD #2, 64 AS I1$, (R-1)*4 AS I2$, 4 AS G1$(R)
1550                    GET #2, J
1560                    AE(R)=CVS(G1$(R))
1570                    GOTO 1620
1580            FIELD #3, 36 AS I1$, (R-17)*4 AS I2$, 4 AS G1$(R)
1590            GET #3, J
1600            AE(R)=CVS(G1$(R))
1610
1620            IF ABS(AE(R))<1E-03 THEN 1780
1630            LN=LN-1
1640            GOSUB 940'      * * CHECK TO SEE IF THERE'S A NOTE FOR THE TRANSACTION
1650            AT=AT+AE(R)
1660            IF X$<>"*" THEN 1690
1670            A8$=""
1680            GOSUB 1000'     * * GET THE NOTE
1690            GOSUB 2150'     * * PRINT THE LINE OF ENTRIES
1700                            * * IF END OF PAGE ADVANCE TO TOP OF FORM AND PRINT A NEW HEADING
1710            IF LN<>5 THEN 1780'     * * TEST FOR A FULL PAGE
1720                    LP=LP+1'        * * INCREMENT THE PAGE NUMBER
1730                    PRINT CHR$(12)' * * ADVANCE TO 'TOP OF FORM'
1740                    PRINT: PRINT "PAGE "LP", STATEMENT OF ACCOUNT "R+9"--", "YR$
1750                    LN=51'          * * RESET THE MAXIMUM LINES/PAGE
1760                    GOSUB 1960'     * * PRINT A SINGLE UNDERSCORE
1770                    GOSUB 2100'     * * PRINT COLUMN HEADS
1780    NEXT J
1790 NEXT M: PRINT
1800 GOSUB 1930'                        * * PRINT A DOUBLE UNDERSCORE
1810 PRINT CHR$(12)'                    * * ADVANCE PAPER TO 'TOP OF FORM'
1820 RETURN
1830 '
1840 CONSOLE 16,0
1850 J1=0:Y$="": INPUT "DO YOU WANT OTHER ACCOUNT STATEMENTS PRINTED AT THIS TIME"; Y$: PRINT
1860    IF LEFT$(Y$,1)="Y" THEN  1160
1870 CLOSE
1880 RUN "CRAS-RS"
1890 '
1900 '          * * * VARIOUS SUBROUTINES
1910 '
1920 '
1930 FORJ2=1TO131:PRINT"=";:NEXTJ2:PRINT: PRINT'        * * PRNT A DOUBLE UNDERSCORE
1940 RETURN
1950 '
1960 FORJ2=1TO131:PRINT"-";:NEXTJ2:PRINT'               * * PRINT A SINGLE UNDERSCORE
1970 RETURN
1980 '
1990 S=INT(66-LEN(B$)/2)'                               * * CALCULATE THE TAB
2000 PRINT TAB(S) B$: PRINT'                            * * PRINT THE NAME/BANK STRING
2010 RETURN
2020 '
2030 '                                                  * * PRINT THE TITLE OF THE STATEMENT
2040 PRINT TAB(52-LEN(AC$(R))/2) "STATEMENT OF ACCOUNT NO." R+9"-- " AC$(R): PRINT
2050 T=INT ((114-LEN(M$(N)+M$(O)))/2)'                  * * CALCULATE THE TAB FOR THE PERIOD TITLE
2060 PRINT TAB(T) "FOR " M$(N) " THROUGH " M$(O)", " YR$: PRINT
2070 RETURN
2080 '
2090 '                                                  * * PRINT THE COLUMNAR HEADS
2100 PRINT "TXN|MO|DA|         PAYEE/PAYOR         |        IN PAYMENT OF        |CHK#|   AMOUNT   |  SUBTOTAL  |    NOTE (May be tr

uncated)"
2110 PRINT "---|--|--|----------------------------|----------------------------|----|------------|------------|--------------------

-----------"
2120 RETURN
2130 '
2140 '                                                  * * PRINT THE LINE OF ENTRIES
2150 PRINT USING WA$; J, M, A1$, A5$, A6$, A7$, AE(R), AT, A8$
2160 A1$="": A5$="": A6$="": A7$="": A8$=""
2170 RETURN
2180 '
2190 PRINT " OPENING BALANCE" TAB(74);: PRINT USING WF$; AB(R)
2200 RETURN
2210 '
2220  IF M=IM THEN P=1: GOTO 2250
2230 M=M-1
2240 GOSUB 570: P=Q+1: M=M+1
2250 GOSUB 570
2260 RETURN
2270 '
2280 GOSUB 640: GOSUB 300: IF M=IM THEN 2330
2290 IF M<=M1 THEN 2330
2300 PRINT "THE LAST MONTH FOR WHICH YOU HAVE ENTERED TRANSACTIONS IS"
2310 PRINT M$(M1)".  WE HAVE SUBSTITUTED THIS AS THE MONTH OF THE STATEMENT"
2320 PRINT "YOU WANT.": PRINT: O=M1: N=IM
2330 RETURN
2340 '
2350 CONSOLE 18,0'                      * * SHIFT PORTS TO THE PRINTER
2360    PRINT CHR$(12)'                 * * ADVANCE THE PAPER TO 'TOP OF FORM'
2370    CONSOLE 16, 0'                  * * SHIFT TO THE CRT
2380    PRINT CHR$(7)'                  * * RING THE BELL
```

```
2390     INPUT "PAPER POSITIONED"; Y$
2400     CONSOLE 18,0'                    * * SHIFT BACK TO THE PRINTER
2410 RETURN
OK
```

CRAS (PROGRAM 9) – SAMPLE RUN

```
      * CHECKING ACCOUNT RECONCILIATION STATEMENT ROUTINE *


HAVE ALL BANK CHARGES AND CREDITS BEEN ENTERED AS TRANSACTIONS?

IF NOT, WE WILL SEND YOU TO ROUTINE (1) TO ENTER THE ADDITIONAL
TRANSACTIONS, AND THEN YOU MAY RETURN TO THIS  ROUTINE.

? YES

YOU ARE ABOUT TO ENTER THOSE TRANSACTION NUMBERS WHICH HAVE
CLEARED THE BANK.  WHERE YOU HAVE MANY NUMBERS IN SEQUENCE, YOU
MAY INPUT THE FIRST AND LAST NUMBERS OF THE SEQUENCE; OR,
YOU MAY ENTER EACH NUMBER, ONE AT A TIME.

DO YOU WANT THE SEQUENCE ROUTINE? NO

ENTER THE TRANSACTION NUMBER OF NEWLY CLEARED TRANSACTIONS.

ENTER A ZERO WHEN YOU ARE FINISHED.

? 226
? 239
? 0
DO YOU WANT A RECONCILIATION STATEMENT PREPARED AT THIS TIME? YES

WHAT IS THE CLOSING DATE SHOWN ON THE BANK STATEMENT?
JULY 26, 1978

WHAT IS THE CLOSING BALANCE SHOWN ON THE BANK STATEMENT? 2592.91
Xx

PAPER POSITIONED?
```

CHECKING ACCOUNT RECONCILIATION STATEMENT FOR JULY 26, 1978

O. E. AND BETTE J. DIAL (50-17741) / FIRST NATIONAL BANK AT BOULDER

1. BANK STATEMENT ENDING BALANCE ..... $ 2,592.91

TRANSACTIONS WHICH HAVE NOT CLEARED:

TXN	MO	DA	PAYEE/PAYOR	CHK#	AMOUNT PAID	AMOUNT RECEIVED
222	7	4	BOB SCHMIDT	1054	145.00	0.00
223	7	7	VISA	1055	80.49	0.00
224	7	7	DELPHI COMPUTER CENTER	1056	1,029.83	0.00
225	7	7	DELPHI COMPUTER CENTER	1057	51.75	0.00
227	7	7	STATE FARM INSURANCE	1059	148.37	0.00
228	7	7	BOOK OF THE MONTH	1060	8.85	0.00
229	7	7	BOOK OF THE MONTH CLUB	1061	11.33	0.00
230	7	7	BVW&S DISTRICT	1062	29.06	0.00
231	7	7	MASTER CHARGE	1063	298.24	0.00
232	7	7	LIFE MAGAZINE	1064	24.00	0.00
233	7	7	JACK T. RUMMEL	1065	16.00	0.00
234	7	7	DORIS M. BENES	1066	25.00	0.00
238	7	15	MCSC	1067	720.40	0.00

2. TOTAL UNCLEARED PAYMENTS RECEIVED ..... $ 0.00

3. TOTAL UNCLEARED PAYMENTS PAID ..... $ 2,588.32-

4. ADJUSTED CHECKING ACCOUNT STATEMENT ..... $ 4.59

5. CHECK REGISTER BALANCE ..... $ 4.59

6. DIFFERENCE BETWEEN THE BANK STATEMENT AND THE CHECK REGISTER ..... $ 0.00

NOTE THAT ITEMS 4 AND 5 SHOULD AGREE

CRAS (PROGRAM 9) – LISTING

```
10 '    ***************************************************************************************************************************
20 '    *                                                                                                                         *
30 '    *                    CRAS (PROGRAM 9): CHECK REGISTER ACCOUNTING SYSTEM - O. E. DIAL   1978                               *
40 '    *                                                                                                                         *
50 '    ***************************************************************************************************************************
60 '
70 '
80 '    ************************************************
90 '    *
100 '   *       CRAS-CAR: CHECKING ACCOUNT RECONCILIATION
110 '   *
120 '   ************************************************
130 '
140 CLEAR 500: WIDTH 132
150 DEFINT I-T
160 CLOSE: Q=0
170 WB$="$  ###,###.##-"
180 WD$="###|##|\\| \                    \ |\  \|###,###.##-|###,###.##-|"
190 '
200 DATA JANUARY, FEBRUARY, MARCH, APRIL, MAY, JUNE, JULY, AUGUST, SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER
210 '
220 DIM M$(12), AB(39), G2$(39)
230 FOR I=1 TO 12
240     READ M$(I)'                  * * READ THE CALENDAR
250 NEXT I
260 '
270 GOTO 860
280 '
290 '           * * * FILING SUBROUTINES
300 '
```

CRAS (PROGRAM 9) – CONTINUED

```
310 '
320 OPEN "R", 9, "BT-INIT1"'            * * GET THE NAME OF THE CHECKING ACCOUNT, BANK, AND THE YEAR
330     FIELD #9, 2 AS IM$, 4 AS RY$, 122 AS NM$
340     GET #9, 1
350     IM=CVI(IM$): YR$=RY$: B$=NM$
360     CLOSE
370     FOR J1=1 TO 122'                * * STRIP THE NULLS FROM THE STRING
380             IF MID$(B$,J1,1)=" " THEN 400
390             B$=MID$(B$,J1): GOTO 410
400     NEXT J1
410 RETURN
420 '
430 OPEN "R", 1, "BT-TRAN1"
440     FIELD #1,2 AS FM$, 2 AS F1$, 1 AS F2$, 1 AS FX$, 1 AS F4$, 30 AS F5$, 30 AS F6$, 4 AS F7$, 2 AS F9$, 4 AS FA$, 1 AS FB$, 50

AS DU$
450     RSET FM$=MKI$(M): RSET F1$=A1$: LSET F2$=A2$: LSET FX$=X$: LSET F4$=A4$: LSET F5$=A5$: LSET F6$=A6$:  RSET F7$=A7$: RSET F9$

=MKI$(QN): RSET FA$=MKS$(A1): LSET FB$=K6$
460     PUT #1, Q
470     CLOSE 1
480 RETURN
490 '
500 OPEN "R", 8, "BT-LMLT1"'            * * GET LAST MONTH AND TRANSACTION NUMBER
510     FIELD #8, 2 AS M1$, 2 AS Q1$, 2 AS QM$, 2 AS QJ$, 120 AS DU$
520     GET #8, 1
530     Q1=CVI(Q1$): M1=CVI(M1$): QM=CVI(QM$): QJ=CVI(QJ$)
540     CLOSE
550 RETURN
560 '
570 OPEN "R", 6, "BT-ACAB2"'            * * GET CHECK REGISTER BALANCE
580 '
590     FOR I = 17 TO 39
600             FIELD #6, 36 AS I1$, (I-17) * 4 AS I2$, 4 AS G2$(I)
610     NEXT I
620     GET #6, M
630     CLOSE
640 '
650     FOR I = 17 TO 39
660             A8(I)=CVS(G2$(I))
670     NEXT I
680 RETURN
690 '
700 OPEN "R", 1, "BT-TRAN1"'            * * TRANSACTION DATA FILE
710     FIELD #1, 2 AS FM$, 2 AS F1$, 1 AS F2$, 1 AS FX$, 1 AS F4$, 30 AS F5$, 30 AS F6$, 4 AS F7$, 2 AS F9$, 4 AS FA$, 1 AS FB$, 50

 AS DU$
720     GET #1,  J
730     A1=CVS(FA$): M=CVI(FM$): QN=CVI(F9$): A1$=F1$: A7$=F7$: A2$=F2$: X$=FX$: A4$=F4$: A5$=F5$: A6$=F6$: K6$=FB$
740     CLOSE
750 RETURN
760 '
770 OPEN "R", 8, "BT-LMLT1"
780     FIELD #8, 2 AS M1$, 2 AS Q1$, 2 AS QM$,  2 AS QJ$, 120 AS DU$
790     RSET M1$=MKI$(M): RSET Q1$=MKI$(Q): RSET QM$=MKI$(QN): RSET QJ$=MKI$(QJ)
800     PUT #8, 1
810     CLOSE 8
820 RETURN
830 '
840 '           * * * PROGRAM CONTINUATION
850 '
860 PRINT CHR$(12)'                     * * TO BLANK THE SCREEN
870 PRINT TAB(5) "* CHECKING ACCOUNT RECONCILIATION STATEMENT ROUTINE *": PRINT: PRINT
880 '
890 PRINT "HAVE ALL BANK CHARGES AND CREDITS BEEN ENTERED AS TRANSACTIONS?": PRINT
900 PRINT "IF NOT, WE WILL SEND YOU TO ROUTINE (1) TO ENTER THE ADDITIONAL"
910 PRINT "TRANSACTIONS, AND THEN YOU MAY RETURN TO THIS  ROUTINE.":PRINT
920 INPUT Y$: PRINT: IF LEFT$(Y$,1)="N" THEN RUN "CRAS-TE"
930 '
940 PRINT "YOU ARE ABOUT TO ENTER THOSE TRANSACTION NUMBERS WHICH HAVE"
950 PRINT "CLEARED THE BANK.  WHERE YOU HAVE MANY NUMBERS IN SEQUENCE, YOU"
960 PRINT "MAY INPUT THE FIRST AND LAST NUMBERS OF THE SEQUENCE; OR,"
970 PRINT "YOU MAY ENTER EACH NUMBER, ONE AT A TIME.": PRINT
980 Y$="": INPUT "DO YOU WANT THE SEQUENCE ROUTINE"; Y$: PRINT
990     J4=0
1000    IF LEFT$(Y$,1)<>"Y" THEN 1110
1010 '
1020     INPUT "FIRST NUMBER, COMMA, LAST NUMBER IN THE SEQUENCE"; JF, JL: PRINT
1030    IF J4<>1 THEN GOSUB 1180'       * * GET THE LAST TRANSACTION NUMBER
1040    J4=1
1050    FOR J = JF TO JL
1060            GOSUB 1240'             * * PLACES A 'TRANSACTION CLEARED' CLODE ON THE RECORD
1070    NEXT J
1080 '
1090    INPUT "MORE SEQUENCES "; Y$: PRINT: GOTO 1000
1100 '
1110 PRINT "ENTER THE TRANSACTION NUMBER OF NEWLY CLEARED TRANSACTIONS.": PRINT
1120 PRINT "ENTER A ZERO WHEN YOU ARE FINISHED.": PRINT
1130    GOSUB 1180'                     * * GET LAST MONTH AND TRANSACTION NUMBER
1140    GOSUB 1210'                     * * CLEAR THE TRANSACTION
1150 GOTO1350
1160 '
1170 '
1180 GOSUB 500'                         * * GET LAST MONTH AND LAST TRANSACTION NUMBER
1190 RETURN
1200 '
1210 INPUT J
1220    IF J=0 THEN 1330'               * * 'ZERO' IS THE EXIT FLAG
1230 '
1240    IF J<=Q1 THEN 1280'             * * Q1 IS THE LAST TRANSACTION NUMBER ON FILE
1250            PRINT "* AN ERROR HAS BEEN MADE.  YOUR LAST ENTRY TO THE REGISTER WAS"
1260            PRINT "TRANSACTION " Q1".  PLEASE REENTER THE NUMBER OF THE TRANS-"
1270            PRINT "ACTION TO BE CLEARED.": PRINT: GOTO 1210
1280    GOSUB 700'              * * GET TRANSACTION DATA
1290    Q=J
1300    A4$="*"
1310    GOSUB 430'                      * * PUT THE 'TRANSACTION CLEARED' CODE ON FILE
```

```
1320    IF J4<>1 THEN 1210'              * * J WILL EQUAL '1' IF IN THE SEQUENCE ROUTINE
1330 RETURN
1340 '
1350 IF QJ<1 THEN QJ=1'                  * * QJ WILL EQUAL '0' IF NO TRANSACTIONS HAVE CLEARED
1360 FOR J = QJ TO Q1'                   * * QJ IS THE LAST TRANSACTION NUMBER IN AN UNINTERRUPTED STREAM OF CLEARED TRANSACTIONS
1370    GOSUB 700'                       * * READ THE TRANSACTION RECORD AND CHECK FOR THE CLEARED CODE
1380    IF A4$<>"*" THEN 1400
1390 NEXT
1400 QJ=J-1:Q=Q1: M=M1: IF QJ<1 THEN QJ=1
1410 '
1420 GOSUB 770'                          * * TO FILE 'QJ'
1430 '
1440 INPUT "DO YOU WANT A RECONCILIATION STATEMENT PREPARED AT THIS TIME"; Y$: PRINT
1450 IF LEFT$(Y$,1)<>"Y" THEN 1750
1460 '
1470 PRINT "WHAT IS THE CLOSING DATE SHOWN ON THE BANK STATEMENT?"
1480    LINE INPUT TD$: PRINT
1490 '
1500 INPUT "WHAT IS THE CLOSING BALANCE SHOWN ON THE BANK STATEMENT"; BE: PRINT
1510 GOSUB 2200'                         * * SHIFT PORTS TO THE PRINTER
1520 GOSUB 1790'                         * * PRINT A DOUBLE UNDERSCORE
1530 GOSUB 320'                          * * GET ACCOUNT/BANK NAMES
1540 GOSUB 1900'                         * * PRINT THE TITLE OF THE STATEMENT AND THE DATE
1550 GOSUB 1850'                         * * PRINT THE NAME OF THE CHECKING ACCOUNT
1560 GOSUB 1820'                         * * PRINT A SINGLE UNDERSCORE
1570 GOSUB 1950'                         * * PRINT COLUMNAR HEADS
1580 '
1590 FT=0: GT=0'                         * * INITIALIZE THE ACCUMULATORS
1600 FOR J = QJ TO Q1'                   * * 'Q1' IS THE LAST TRANSACTION ON FILE
1610    GOSUB 700'                       * * GET THE 'TRANSACTION CLEARED' CODE FOR EACH RECORD
1620    IF A4$="*" THEN 1640
1630    GOSUB 2040'                      * * PRINT THE UNCLEARED TRANSACTION DATA AND ACCUMULATE THE AMOUNTS
1640 NEXT
1650 '
1660 M=M1+1'                             * * 'M1' IS THE LAST TRANSACTION MONTH ON FILE
1670 GOSUB 570: M=M-1'                   * * GET THE CHECK REGISTER BALANCE
1680 GOSUB 2110'                         * * PRINT THE RECONCILIATION DATA
1690 GOSUB 1790'                         * * PRINT A DOUBLE UNDERSCORE
1700 PRINT CHR$(12)'                     * * ADVANCE THE PAPER TO 'TOP OF FORM'
1710 '
1720 CONSOLE 16,0'                       * * RETURN TO THE CRT PORT
1730 PRINT CHR$(12)'                     * * CLEAR THE SCREEN
1740 '
1750 RUN "CRAS-RS"
1760 '
1770 '          * * * VARIOUS SUBROUTINES
1780 '
1790 FORJ2=1TO131:PRINT"=";:NEXTJ2:PRINT: PRINT'        * * PRINT A DOUBLE UNDERSCORE
1800 RETURN
1810 '
1820 FORJ2=1TO131:PRINT"-";:NEXTJ2:PRINT'               * * PRINT A SINGLE UNDERSCORE
1830 RETURN
1840 '
1850 Y$=B$'                                             * * FORM A TITLE STRING
1860    GOSUB 2270'                                     * * CENTER AND PRINT THE STRING
1870 RETURN
1880 '
1890 Y$=B$'                                                     * * FORM THE NAME/BANK STRING
1900 Y$="CHECKING ACCOUNT RECONCILIATION STATEMENT FOR " + TD$
1910 GOSUB 2270'                                        * * CENTER AND PRINT THE STRING
1920 RETURN
1930 '
1940 '                                                  * * PRINT THE COLUMNAR HEADS
1950 PRINT: PRINT TAB(23) "1. BANK STATEMENT ENDING BALANCE ....................................." TAB(98);: PRINT USING  WB$; B

E: PRINT
1960    PRINT TAB(42) "TRANSACTIONS WHICH HAVE NOT CLEARED:"
1970    PRINT TAB(27);:FOR L = 1 TO 66: PRINT "-";: NEXT L: PRINT
1980          PRINT TAB(27);: PRINT "TXN|MO|DA|" TAB(44) "PAYEE/PAYOR" TAB(63)"|CHK#|  AMOUNT   |  AMOUNT   |"
1990    PRINT TAB(27);: PRINT "   |  |  |                                |    |   PAID    | RECEIVED  |"
2000    PRINT TAB(27);: PRINT "---|--|--|--------------------------|----|-----------|-----------|"
2010 RETURN
2020 '
2030 '                                                  * * ACCUMULATE THE AMOUNTS AND PRINT TRANSACTION DATA
2040 IF A2$="C" THEN F1=A1 ELSE F2=A1
2050    PRINT TAB(27);: PRINT USING WD$; J; M; A1$; A5$; A7$; F1; F2
2060    FT=FT+F1: GT=GT+F2
2070    F1=0: F2=0: A1$="": A5$="":A7$=""'              * * INITIALIZE TRANSACTION DATA
2080 RETURN
2090 '
2100 '                                                  * * PRINT THE RECONCILIATION DATA
2110 PRINT TAB(27);: FOR L = 1 TO 66: PRINT"-";: NEXT: PRINT
2120 PRINT:  PRINT TAB(23)  "2. TOTAL UNCLEARED PAYMENTS RECEIVED ....................................." TAB(98);: PRINT USING WB$;

GT
2130    PRINT:   PRINT TAB(23) "3. TOTAL UNCLEARED PAYMENTS PAID ....................................." TAB(98);: PRINT USING WB

$; FT*(-1)
2140    PRINT: PRINT TAB(23) "4. ADJUSTED CHECKING ACCOUNT STATEMENT ....................................." TAB(98);: PRINT USING WB$;

 BE+GT-FT
2150    PRINT: PRINT TAB(23) "5. CHECK REGISTER BALANCE ....................................." TAB(98);: PRINT USING WB$;

 AB(37)
2160    PRINT: PRINT TAB(23) "6. DIFFERENCE BETWEEN THE BANK STATEMENT AND THE CHECK REGISTER ....." TAB(98);: PRINT USING WB$;

 BE+GT-FT-AB(37)
2170    PRINT: PRINT TAB(45) "NOTE THAT ITEMS 4 AND 5 SHOULD AGREE"
2180 RETURN
2190 '
2200 CONSOLE 18,0'                                      * * SHIFT TO THE PRINTER
2210    PRINT CHR$(12)'                                 * * ADVANCE THE PAPER TO 'TOP OF FORM'
2220    CONSOLE 16,0'                                   * * RETURN TO THE CRT PORT
2230    INPUT "PAPER POSITIONED "; Y$: PRINT
2240    CONSOLE 18,0'                                   * * RETURN TO THE PRINTER PORT
2250 RETURN
2260 '
2270 PRINT TAB(INT((132-LEN(Y$))/2)) Y$: PRINT'         * * CENTER AND PRINT THE STRING 'Y$'
2280 RETURN
OK
```

"I'll Put You on Hold and Check"

BY RAY VUKCEVICH

Do you leave your customers wondering if they've been disconnected, or worse, listening to canned music, while you search your lists and catalogs to see if you have what they want? INVENTORY program eliminates waiting.

When a customer calls, punch in either the stock number or item name. If the part is in stock, you will be told at once the location, the quantity on hand, the unit cost, the number per case, the cost per case and the estimated date of a new shipment. If the part is ordered, the program immediately changes your inventory. New items can be added to the list and the complete inventory printed.

Written for a Micropolis drive, the program uses Micropolis Extended BASIC (ver. 2.0), but should easily convert to other BASICs. To use the program with a Micropolis drive, simply create a new data file with OPEN 1 "N:INVENTORY", then close the file with CLOSE 1. The program will use that empty file for your inventory work.

INVENTORY program first offers a menu from which you can check the inventory, change item information, add new items, print the inventory or end the program. The -1 command ends the current task or allows you to go back to the menu if you change your mind.

To check the inventory, use the stock number or item name. This routine will tell you if you do not stock the item.

When changing item information, you are shown the current information; you may then change what you want. If the stock number is not on your inventory, you will be told.

Creating your inventory list or adding new items is easy. You are prompted for all information needed; the file INVENTORY stores the data.

Task command 4 will print your complete inventory in the form shown. This form can easily be changed to meet your special needs. If your inventory contains only a few items, you can store the program on the same disk and call it something else – INVEN, for example.

Illustration by Casserine Toussaint

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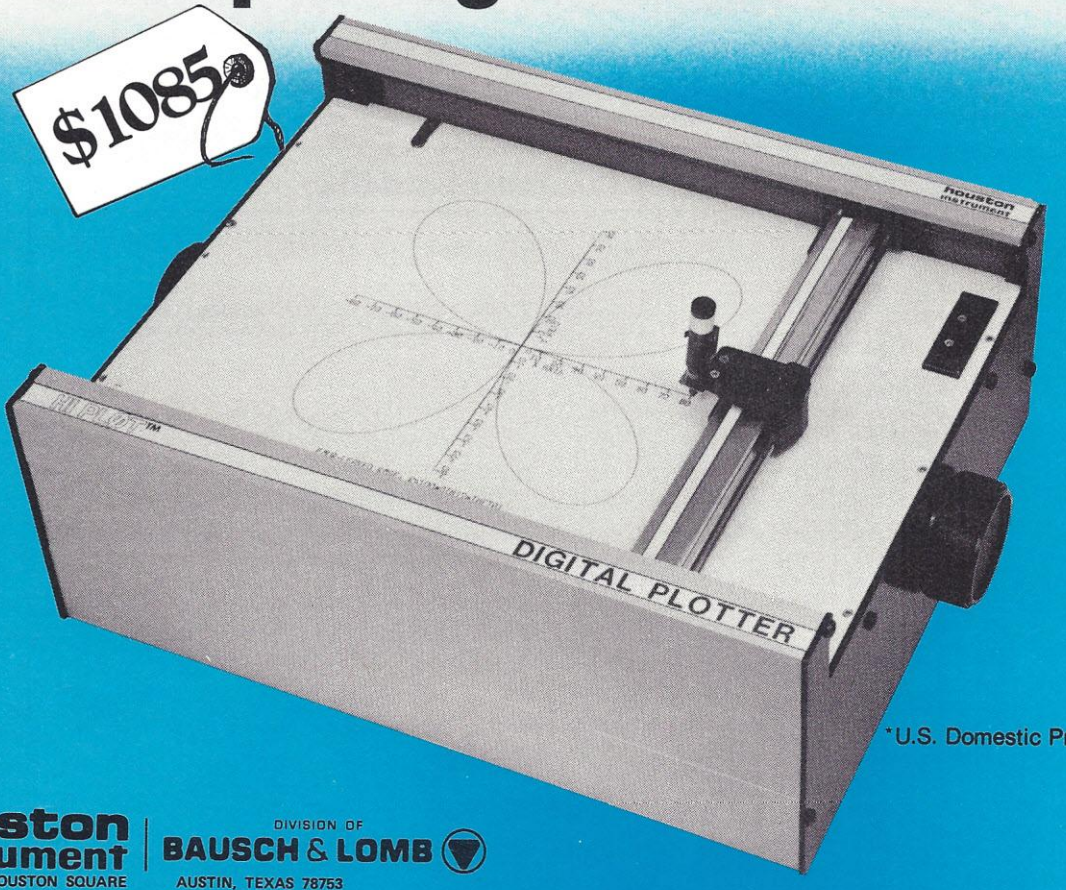

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CIRCLE 16

INVENTORY Sample Run

```
THIS PROGRAM ALLOWS YOU TO EXAMINE YOUR INVENTORY
AND MAKE CHANGES WHEN ORDERS ARE MET OR NEW SHIPMENTS
ARRIVE.

                  TASK
                  ----

        0  FINISHED.
        1  CHECK INVENTORY.
        2  CHANGE ITEM INFORMATION.
        3  ADD NEW ITEMS.
        4  PRINT INVENTORY.

TASK NUMBER? 1


YOU CAN USE THE STOCK NUMBER OR THE NAME OF THE ITEM.
TYPE -1 WHEN FINISHED EXAMINING YOUR INVENTORY.

S=STOCK NUMBER -- I=ITEM NAME? S
STOCK NUMBER? 1.4

STOCK NUMBER:  1.4              ITEM: RES 990 OM

LOCATION--AISLE: 1  SEC: A  SHELF: 4

HOW MANY:  1500                 COST/UNIT:  .1

NUM/CASE:  10   COST/CASE:  1

DATE/NEXT SHIPMENT:  3 / 3 / 78

S=STOCK NUMBER -- I=ITEM NAME? I
ITEM NAME? PHONE JACK

STOCK NUMBER:  2.1              ITEM: PHONE JACK

LOCATION--AISLE: 4  SEC: B  SHELF: 2

HOW MANY:  20000                COST/UNIT:  .5

NUM/CASE:  12   COST/CASE:  5.75

DATE/NEXT SHIPMENT:  4 / 1 / 78

S=STOCK NUMBER -- I=ITEM NAME? -1
                    *   *   *

TASK NUMBER? 2

USE THIS ROUTINE TO CHANGE YOUR INVENTORY.
STOCK NUMBER OF ITEM TO BE CHANGED? 2.5

STOCK NUMBER:  2.5              ITEM: 1/2 BOLT
LOCATION--AISLE: 4  SEC: C  SHELF: 1
HOW MANY:  15000                COST/UNIT:  .1
NUM/CASE:  100  COST/CASE:  9
DATE/NEXT SHIPMENT:  2 / 2 / 78

MAKE CHANGES HERE. TYPE -1 IF YOU CHANGE YOUR MIND.

STOCK NUMBER? 2.5
ITEM? 1/2 BOLT
LOCATION (AISLE, SECTION, SHELF)? 4,C,1
HOW MANY? 10000
COST/UNIT? .1
NUM/CASE AND COST/CASE (IE. 12,17.56)? 100,9
DATE OF NEXT SHIPMENT (IE. 9,11,78)? 2,10,78

DO YOU HAVE ANY OTHER CHANGES? Y
USE THIS ROUTINE TO CHANGE YOUR INVENTORY.
STOCK NUMBER OF ITEM TO BE CHANGED? 4.5
NUMBER NOT ON INVENTORY.

DO YOU HAVE ANY OTHER CHANGES? N
                    *   *   *

TASK NUMBER? 3

ADD TO YOUR INVENTORY HERE. TYPE -1 WHEN FINISHED.

STOCK NUMBER? 3.1
ITEM? CIR BOARD 2
LOCATION (AISLE, SECTION, SHELF)? 4,C,5
HOW MANY? 200
COST/UNIT? 2.15
NUMBER/CASE AND COST/CASE (IE. 12,25.75)? 10,2.40
EXPECTED DATE OF NEW SHIPMENT (IE. 9,11,78)? 5,1,78
STOCK NUMBER? -1
```

Program Listing

```
10 REM INVENTORY PROGRAM BY RAY VUKCEVICH 1,9,78
20 PRINT TAB(20);"INVENTORY"
30 PRINT
40 PRINT "THIS PROGRAM ALLOWS YOU TO EXAMINE YOUR INVENTORY"
50 PRINT "AND MAKE CHANGES WHEN ORDERS ARE MET OR NEW SHIPMENTS"
60 PRINT "ARRIVE."
70 PRINT
80 PRINT TAB(20);"TASK"
90 PRINT TAB(20);"-----"
100 PRINT
110 PRINT TAB(10);"0  FINISHED."
120 PRINT TAB(10);"1  CHECK INVENTORY."
130 PRINT TAB(10);"2  CHANGE ITEM INFORMATION."
140 PRINT TAB(10);"3  ADD NEW ITEMS."
150 PRINT TAB(10);"4  PRINT INVENTORY."
160 PRINT
170 INPUT "TASK NUMBER";J
180 PRINT
190 IF J=0 THEN 1270
200 IF J=1 THEN 390
210 IF J=2 THEN 710
220 IF J=4 THEN 1060
230 IF J>4 THEN 80
240 PRINT "ADD TO YOUR INVENTORY HERE. TYPE -1 WHEN FINISHED."
250 PRINT
260 OPEN 1 "INVENTORY"
270 INPUT "STOCK NUMBER";A
280 IF A=-1 THEN 370
290 INPUT "ITEM";A$
300 INPUT "LOCATION (AISLE, SECTION, SHELF)";B$,C$,D$
310 INPUT "HOW MANY";B
320 INPUT "COST/UNIT";C
330 INPUT "NUMBER/CASE AND COST/CASE (IE. 12,25.75)";D,E
340 INPUT "EXPECTED DATE OF NEW SHIPMENT (IE. 9,11,78)";F,G,H
350 PUT 1 A;","+A$+","+B$+","+C$+","+D$+","+B;C;D;E;F;G;H
360 GOTO 270
370 CLOSE 1
```

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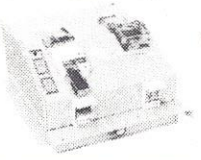

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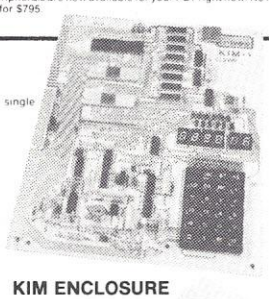

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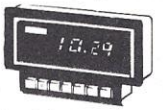

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CIRCLE 17

Program Notes

Note the OPEN and CLOSE statements (lines 260 and 370). Your system may use different commands. PUT statements (line 350) add data to the file. Note that the string delimiter (,) is concatenated on the strings. To avoid loading a space into the file, you must include the delimiter before the first string. Your system may not find this necessary. GET statements (line 520) take data from the disk and make it available to the program. END statements are included in the OPEN statements (line 720, for example).

Lines 720 to 810 find the record number of the item to be changed. The variable "k" is used to find the record (see line 830). After the information has been changed, the same variable is used to put the new data back in the same record (see line 1000)

Lines 1080 and 1250 are used in my set-up to turn the printer on and off. You will want to use your own arrangement.

If you *must* deal with a specific record (this shouldn't happen), note that the first number on the inventory print-out is the record number.

This program will give you immediate information on the state of your stock. Your customers will appreciate a prompt reply to their inquiries, and maybe you can SCRATCH your canned music. □

```
380 GOTO 80
390 PRINT
400 PRINT "YOU CAN USE THE STOCK NUMBER OR THE NAME OF THE ITEM."
410 PRINT "TYPE -1 WHEN FINISHED EXAMINING YOUR INVENTORY."
420 PRINT
430 OPEN 1 "INVENTORY" END 670
440 REM SET POINTER TO 1
450 GETSEEK (1)=1
460 INPUT "S=STOCK NUMBER -- I=ITEM NAME";X$
470 IF X$="-1" THEN 690
480 IF X$="S" THEN 560
490 IF X$<>"I" THEN 460
500 INPUT "ITEM NAME";N$
510 IF N$="-1" THEN 690
520 GET 1 A,A$,B$,C$,D$,B,C,D,E,F,G,H
530 REM CHECKS ITEM NAME AGAINST LIST
540 IF N$<>A$ THEN 520
550 GOTO 600
560 INPUT "STOCK NUMBER";N
570 IF N=-1 THEN 690
580 GET 1 A,A$,B$,C$,D$,B,C,D,E,F,G,H
590 IF A<>N THEN 580
600 PRINT
610 PRINT "STOCK NUMBER: ";A,"ITEM: ";A$:PRINT
620 PRINT "LOCATION--AISLE: ";B$;"  SEC: ";C$;"  SHELF: ";D$:PRINT
630 PRINT "HOW MANY: ";B,"COST/UNIT: ";C:PRINT
640 PRINT "NUM/CASE: ";D,"COST/CASE: ";E:PRINT
650 PRINT "DATE/NEXT SHIPMENT: ";F;"/";G;"/";H:PRINT
660 GOTO 450
670 PRINT "DO NOT STOCK."
680 GOTO 450
690 CLOSE 1
700 GOTO 80
710 PRINT "USE THIS ROUTINE TO CHANGE YOUR INVENTORY."
720 OPEN 1 "INVENTORY" END 800
730 LET K=1
740 INPUT "STOCK NUMBER OF ITEM TO BE CHANGED";N
750 GETSEEK (1)=1
760 GET 1 A
770 IF A=N THEN 810
780 LET K=K+1
790 GOTO 760
800 PRINT "NUMBER NOT ON INVENTORY."
810 CLOSE 1
820 OPEN 1 "INVENTORY" END 1010
830 GET 1 RECORD K A,A$,B$,C$,D$,B,C,D,E,F,G,H
840 PRINT
850 PRINT "STOCK NUMBER: ";A,"ITEM: ";A$
860 PRINT "LOCATION--AISLE: ";B$;"  SEC: ";C$;"  SHELF: ";D$
870 PRINT "HOW MANY: ";B,"COST/UNIT: ";C
880 PRINT "NUM/CASE: ";D,"COST/CASE: ";E
890 PRINT "DATE/NEXT SHIPMENT: ";F;"/";G;"/";H
900 PRINT
910 PRINT "MAKE CHANGES HERE. TYPE -1 IF YOU CHANGE YOUR MIND.":PRINT
920 INPUT "STOCK NUMBER";A
930 IF A=-1 THEN 1010
940 INPUT "ITEM";A$
950 INPUT "LOCATION (AISLE, SECTION, SHELF)";B$,C$,D$
960 INPUT "HOW MANY";B
970 INPUT "COST/UNIT";C
980 INPUT "NUM/CASE AND COST/CASE (IE. 12,17.56)";D,E
990 INPUT "DATE OF NEXT SHIPMENT (IE. 9,11,78)";F,G,H
1000 PUT 1 RECORD K A;",";+A$+",";B$+",";C$+",";D$+",";B;C;D;E;F;G;H
1010 CLOSE 1
1020 PRINT
1030 INPUT "DO YOU HAVE ANY OTHER CHANGES";Q$
1040 IF LEFT$(Q$,1)="Y" THEN 710
1050 GOTO 80
1060 PRINT "YOUR ENTIRE INVENTORY WILL BE PRINTED HERE."
1070 INPUT "DATE OF THIS PRINTING (IE. 9,11,78)";R,S,T
1080 PRINT CHAR$(27);CHAR$(64):REM TURN ON PRINTER
1090 PRINT TAB(10);"STOCK ON ";R;"/";S;"/";T
1100 PRINT:PRINT
1110 OPEN 1 "INVENTORY" END 1220
1120 LET K=1
1130 GETSEEK (1)=1
1140 GET 1 A,A$,B$,C$,D$,B,C,D,E,F,G,H
1150 PRINT TAB(5);K;TAB(10);"S#";A;TAB(20);A$;TAB(35);"AISLE: ";B$;
1160 PRINT "  SEC: ";C$;"  SHELF: ";D$
1170 PRINT TAB(10);B;TAB(20);"C/U";C;TAB(30);"N/C";D;TAB(40);"C/C";E
1180 PRINT TAB(10);"NEXT SHIPMENT";F;"/";G;"/";H
1190 PRINT
1200 K=K+1
1210 GOTO 1140
1220 PRINT
1230 PRINT TAB(25);"END OF INVENTORY."
1240 CLOSE 1
1250 PRINT CHAR$(27);CHAR$(65):REM TURN OFF PRINTER
1260 GOTO 80
1270 END
```

PCC PUBLICATIONS
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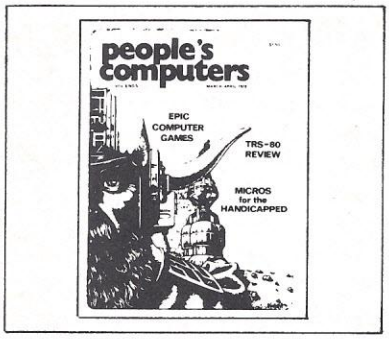

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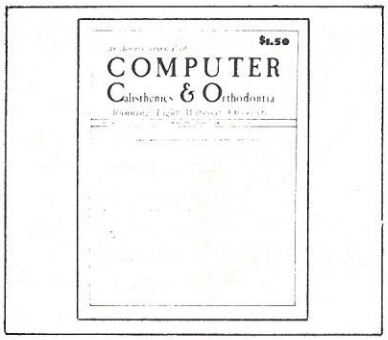
A magazine for beginning and intermediate level computer users, educators and those who wonder what computing is all about. It covers everything from elementary programming to assembly language, from ready-to-use program listings to the development of a new language. Not to mention games, listings, surveys, interviews and consumer advice. No paid advertising.
Published bimonthly. $2.00 per copy.



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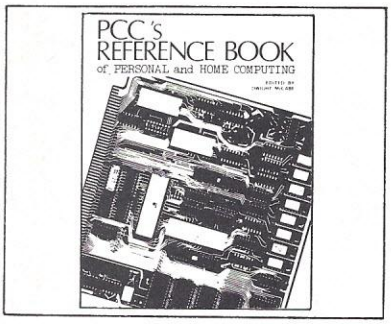

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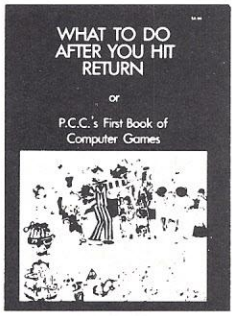

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PEOPLE'S COMPUTER CO.

CIRCLE 18

SCROLLING WITH AN UNSEEN HAND

BY KAREN S. WOLFE

Add a touch of suspense, surprise and distinction to your programs by making words appear on your screen at a readable rate, as if written by an unseen hand. If not used excessively, this technique – called scrolling – strengthens effects and emphasizes impacts, especially in games.

If your system's baud rate is already slow, say 300, scrolling will not prove as effective. But for higher baud rates the technique offers a pleasing change of pace.

The accompanying program (part of a game project I never finished) demonstrates the process and serves as a test program for you to adjust the time delay statements to your baud rate. Notice that statements 10 through 40 of the program, set arrays equal to the phrases to be printed.

Statement 50 begins a FOR/NEXT loop with variable E equal to 1 through 29 (the total number of characters, including blank spaces, in the A$ array). Statement 55 moves the cursor to the Eth position on the line, TAB (E), and prints the Eth character from the A$ array. For example, when E equals 3, the program will cause "U" to be printed in the 3rd position on the line. The comma after A$ (E,E) in statement 55 keeps the cursor on the line after each print command in the loop.

Statement 60 is the time delay control. This statement slows the printing of the A$ array down to a readable speed. The baud rate for my system is 2,400. If I let X= 1 to 60, the phrases print out at a comfortable reading speed. For systems with higher baud rates, increase the time delay perhaps to X= 1 to 100 or X= 1 to 150 or more. If you have a slower baud rate, you may want to decrease the time delay, perhaps to X= 1 to 30 or less. Experiment with the time delay until it produces the effect you desire.

Statement 70 refers the program back to statement 50, allowing the next character in the A$ array to be printed. After this loop is completed, statement 80 allows the cursor to go to the next line to begin printing the B$ array as instructed in statements 90 through 105.

Examine the D$ array and statements 140 to 155. The only difference between the D$ array and the others is formatting – the blank spaces preceding the word "TERMINATED". The print statement is also changed by the omission of the comma after D$(E,E) in statement 145. You should run the program just to watch what this omission creates.

The program is written for North Star BASIC but you can easily adapt the program for any BASIC with a TAB function. □

PROGRAM LISTING

```
5 DIM A$(64), B$(64), C$(64), D$(64)
10 LET A$(1,29)="YOU HAVE BEEN CAPTURED BY THE"
20 LET B$(1,29)="SINISTER FORCES OF THE EMPIRE"
30 LET C$(1,23)="AND YOU ARE TO BE......"
40 LET D$(1,21)="          TERMINATED!"
50 FOR E= 1 TO 29
55 PRINT TAB (E), A$(E,E),
60 FOR X= 1 TO  60\ NEXT X
70 NEXT E
80 PRINT
90 FOR E= 1 TO 29
95 PRINT TAB (E), B$(E,E),
100 FOR X= 1 TO 60\ NEXT X
105 NEXT E
110 PRINT
115 FOR E= 1 TO  23
120 PRINT TAB (E), C$(E,E),
125 FOR X= 1 TO 60\ NEXT X
130 NEXT E
135 PRINT
140 FOR E= 1TO 21
145 PRINT TAB (E), D$(E,E)
150 FOR X= 1 TO 60\ NEXT X
155 NEXT E
READY
```

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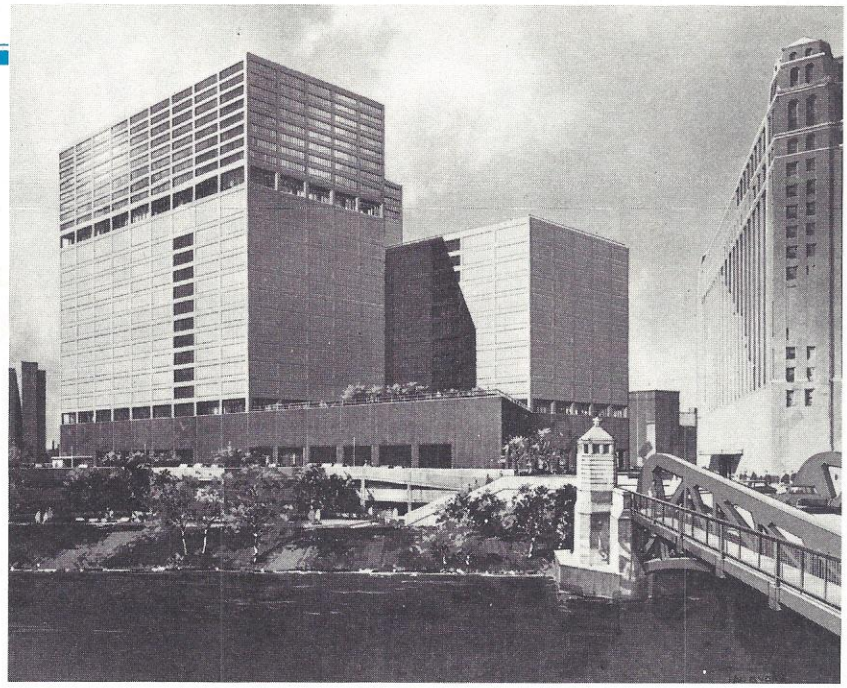


Personal Computing Expo Returns To Chicago, Oct. 5-8

The "second encounter of the computer kind" occurs next month in Chicago when the second annual Midwest Personal Computing Exposition opens its doors October 5 - 8.

The four-day show, sponsored by Personal Computing Magazine, will be held in the new Merchandise Mart's Expocenter in downtown Chicago.

The theme of this year's show is "the dawning of a new age," and the wide variety of personal computing hardware, software and services on display will reflect the widespread use of these products in business, the professions and in the home.

COMPLETE SHOWROOM OF PRODUCTS, SERVICES FEATURED

The Midwest Personal Computing Expo is designed with both the professional and the computer novice in mind. As a result, the range of products and services on exhibit will cater to all levels of knowledge and expertise.

Professionals will want to view the latest in systems that can streamline their accounting, bookkeeping and inventory procedures by providing features such as mass storage, video displays and line printers.

Newcomers to the personal computing world will enjoy learning about the new economically-priced, table-top units that can provide hours of electronic fun, assistance with home budgeting or immediate help in their own small business.

A complete range of personal computing software and services will also be displayed.

Show visitors will be able to not only examine firsthand a vast array of the latest equipment, but will get a chance to rap with computer experts and attend free, informative "how-to" clinics.

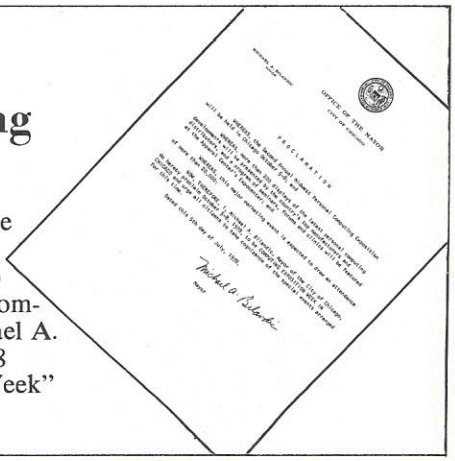
The Midwest Personal Computing Expo thus provides a "full service" show for personal computing advocates of every technical level. Here is a chance for everyone to learn precisely what equipment and services they need for their business or personal use.

SHOW HOURS:

Thurs., Oct. 5 — 10 AM - 6 PM
Fri., Sat., Oct. 6 & 7 — 10 AM - 8 PM
Sunday, Oct. 8 — 12 Noon - 6 PM

Oct. 4-8 Proclaimed "Personal Computing Expo Week"

CHICAGO—In recognition of the impact computers are making in changing American lifestyles and to salute the '78 Midwest Personal Computing Expo, Chicago Mayor Michael A. Bilandic has proclaimed Oct. 4-8 "Personal Computing Exposition Week" in Chicago.



SEMINARS, "HOW-TO" CLINICS FEATURED AT FOUR-DAY SHOW

A complete seminar program, focusing on some 15 different topics, will be presented throughout the entire four days of the show. Seminar subjects will range from "How To Better Manage Your Office With A Small Computer" to "Introduction To BASIC," in which beginners will learn the simplicity of operating a microcomputer.

Admission prices for the seminar programs are:
1-Hour Sessions — $10
2-Hour Sessions — $20

Included in the general admission price to the exhibits are nearly 20 free "how-to-clinics" in which leading manufacturers will deliver presentations about their products and their uses.

Note: Information contained in the following Seminar Schedule was that which was available at the time of publication.

THURSDAY, OCTOBER 5, 1978

10:00 AM - 11:00 AM

01—HOW TO BETTER MANAGE YOUR OFFICE WITH A SMALL COMPUTER

Speaker: Gary Dozier, Personal Computing Magazine, Boston, MA

In what ways can you improve the efficiency of your office with a micro/mini computer? You may enhance order entry or invoicing. You might shorten filing and access time. You could have your cost control and payroll linked to inventory or purchasing. Your staff might draw upon the word processing of a minicomputer. Personnel may use the computer in introducing the company and training staff. Security and energy conservation are two other areas of potential computer use to help make your office more efficient at a reasonable cost. Your instructor will outline a surprising list of functions the microcomputer could handle for you, reviewing costs, complexity of operations, and economical significance.

10:00 AM - 11:15 AM

02—INTRODUCTION TO BASIC

Speaker: Eugene Murrow, Computer Power and Light, Studio City, CA

This session will introduce the beginner to using a personal computer by programming in the simplest of computer languages, BASIC. Besides an extensive discussion on what computers are and how computer languages are used, this seminar will include hands-on demonstrations. It might be your first time at a microcomputer, but your instructor will show you how simple it is to operate.

SEMINAR SCHEDULE (cont'd.)

11:00 AM - 12:00 PM

03—MICROCOMPUTERS AND THE ACCOUNTANT — A USER APPROACH

Speaker: David Kominiak, Meade Electronics Co., Munster, IN

This session will present an overview of the microcomputer for the serious user: it will cover the definitions of the microcomputer, advantages and disadvantages, applications, hardware selection, software selection, evaluation of software packages, questions to be asked and evaluations to be made when purchasing a microcomputer. It will also include the problem of maintenance service and support. The session will conclude with a look at computer control guidelines and sources of information for microcomputer users in professional services.

04—THE MICROCOMPUTER USERS BILL OF RIGHTS

Speaker: Irvin Shapiro, Microbus Inc., Skokie, IL

Advancements in low cost computer peripheral equipment are beginning to bring the advantages of Electronic Data Processing to the small businessman and professional. Along with the increased capabilities of the micro computer come increased responsibilities. The user of a micro computer business system has the right to expect the same quality of services provided to mini and mainframe computer users. This session will outline these services.

3:00 PM - 4:00 PM

05—PERSONAL GUIDE TO PERSONAL COMPUTING

Speaker: Russ Walter, Consultant, Boston, MA

Why will you want a computer in your home or business? Can a personal computer do as much as a computer that costs a million dollars? Does it understand English? Is it hard to program? Can it run a business? Which personal computers are the most popular, and why? How do you make a computer sing, give a speech and draw pictures in color? Which computer should you buy, and what's the fastest way to learn to use it? What exhibits at the show will meet your own needs best, and what questions should you ask the exhibitors? Will every home and business eventually have a computer, and if so, when? This seminar will answer those questions.

6:00 PM - 8:00 PM

CONTROVERSIES IN PERSONAL COMPUTING

Speaker: Russ Walter, Consultant, Boston, MA

This fast moving industry of personal computers has generated some problems among users and manufacturers that are difficult to understand. Program copyrights and which company owns what are some of the controversies that this session will address.

7:00 PM - 8:15 PM

02—INTRODUCTION TO BASIC

Speaker: Eugene Murrow, Computer Power and Light, Studio City, CA

This session will introduce the beginner to using a personnal computer by programming in the simplest of computer languages, BASIC. Besides an extensive discussion on what computers are and how computer languages are used, this seminar will include hands-on demonstrations. It might be your first time at a microcomputer, but your instructor will show you how simple it is to operate.

FRIDAY, OCTOBER 6, 1978

10:00 AM - 11:00 AM

07—HOW TO PROCESS WORDS ON THE MICRO COMPUTER

Speaker: Nabih Mangoubi, President, Nabih's Inc., Evanston, IL

You must send those fifty letters to your clients or associates. The copy is almost the same in every instance. Meanwhile, you are toying with phrases and sentences groping for the right expression to put into that speech you are delivering. A microcomputer with a hard copy printer and a word processing software package will handle these problems with efficiency and ease. The instructor will highlight the hardware and software requirements, capabilities and costs.

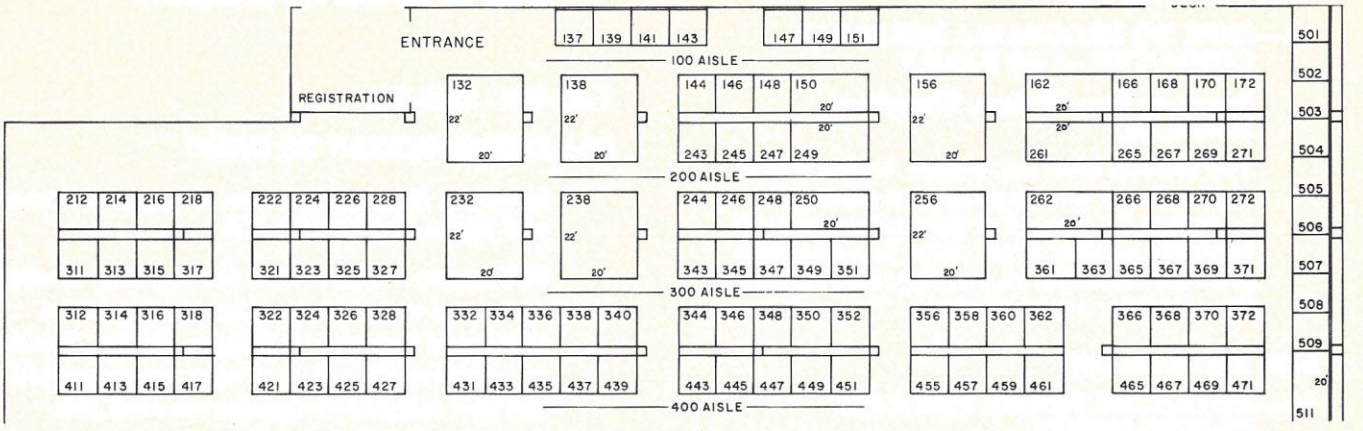
LIST OF FREE "HOW-TO" CLINICS IN THIS SECTION

10:00 AM - 11:00 AM

08—SOFTWARE FOR YOUR MICRO-COMPUTER

Speaker: Dr. Y. P. Chien, Systems and Software, Downers Grove, IL

This session will survey the software available to the microcomputer user with emphasis on language sources and language processes. The speaker will also address the subject of operating systems and the software available for these systems.



FLOOR PLAN

SEMINAR SCHEDULE (cont'd.)

10:00 AM - 11:15 AM

02—INTRODUCTION TO BASIC

Speaker: Eugene Murrow, Computer Power and Light, Studio City, CA

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2:00 PM - 3:00 PM

09—HOW TO GENERATE COMPUTER GRAPHICS FOR BUSINESS AND ENTERTAINMENT

Speaker: Gary Dozier, Personal Computing **Magazine, Boston, MA**

Transposing all those statistics into bar and circle graphs for your marketing and production program is an arduous and time consuming task. Inputting the corresponding data to your microcomputer will be quicker and more efficient. The software that controls the graphics is versatile and easy to understand. The instructor will show you how to create top notch graphics, possibly with movement, color, and on-line editing capabilities; then generate a hard copy for distribution to the staff.

2:00 PM - 3:00 PM

10—DOES YOUR BUSINESS NEED A MINI/MICRO COMPUTER

Speaker: Richard Friedman, General Business Consultants, Inc., Chicago, IL

Mini and micro computers can be "low cost" tools for increasing the profitability and efficiency of smaller businesses. But, hidden costs and risks can instead create a burdensome expense. This seminar will describe potential problems and ways to avoid them, explain the practical differences between mini and micro computers in a business environment, present a method for determining which type of computer would be worthwhile for your business.

SEMINAR SCHEDULE (cont'd.)

3:00 PM - 4:00 PM

11—HOW TO PROGRAM A PERSONAL COMPUTER — SO EASILY

Speaker: Russ Walter, Consultant, Boston, MA

Ten minutes after the seminar begins, you'll already know how to program a personal computer. By the end of the seminar, you will know the experts' tricks about how to reduce even the most difficult problems into language the computer can understand.

6:00 PM - 8:00 PM

12—ADVANCED TRICKS FOR EASY PROGRAMMING

Speaker: Russ Walter, Consultant, Boston, MA

Programming even the toughest applications is easy — once you know a few tricks. The seminar will cover most every trick that has been devised to get the job done and intelligently.

7:00 PM - 8:15 PM

02—INTRODUCTION TO BASIC

Speaker: Eugene Murrow, Computer Power and Light, Studio City, CA

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7:00 PM - 8:00 PM

13—SELECTING A MINI/MICRO COMPUTER FOR YOUR BUSINESS

Speaker: Richard Friedman, General Business Consultants, Inc., Chicago, IL

Selecting a mini or micro computer can be confusing. There are many, many different systems on the market, with a wide variety of hardware and software features and capacities. This seminar will describe the key considerations in selecting a system, explain how to compare different costs and features, present an approach for selecting the hardware, software and vendor that best suit your business needs.

SATURDAY, OCTOBER 7, 1978

10:00 AM - 11:15 AM

02—INTRODUCTION TO BASIC

Speaker: Eugene Murrow, Computer Power and Light, Studio City, CA

This session will introduce the beginner to using a personal computer by programming in the simplest of computer languages, BASIC. Besides an extensive discussion on what computers are and how computer languages are used, this seminar will include hands-on demonstrations. It might be your first time at a microcomputer, but your instructor will show you how simple it is to operate.

2:00 PM - 3:00 PM

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4:00 PM - 5:00 PM

Seminar 02, "Introduction to BASIC," is repeated (see Saturday 10:00 AM)

4:00 PM - 5:00 PM

14—BEFORE YOU BUY A PERSONAL COMPUTER

Speaker: Russ Walter, Consultant, Boston, MA

With so many exhibitors to choose from, how should you decide to spend your money? This seminar gives you background on the exhibitors, compares them, tells you how to avoid common pitfalls, and — most important — trains you to prune out the companies that do not fit your needs. Before you buy a personal computer what questions should you ask the seller? When you finish this seminar you will know.

6:00 PM - 8:00 PM

15—ADVANCED STRATEGIES FOR BUYING

Speaker: Russ Walter, Consultant, Boston, MA

How to get the personal computer you want and pay less for it.

SUNDAY, OCTOBER 8, 1978

2:00 PM - 3:00 PM

16—HOW TO MAKE MUSIC WITH YOUR MICROCOMPUTER

Speaker: Gary Dozier, Personal Computing Magazine, Boston, MA

An in-depth approach to hardware and software needed to generate multi-part melifluous music — via the microcomputer and an amplifier-speaker system. Several hardware adaptations along with corresponding programming languages will be reviewed, demonstrated, and compared from simplicity of operation to cost, from availability to quality.

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FREE "HOW-TO-CLINIC" SCHEDULE

These forty-five minute commercial presentations are designed to give the attendee a better perspective on the exhibitors' products. The cost of these clinics is included in the exhibit admission price.

Thursday, October 5, 1978
1:00 PM - 1:45 PM
Presented by Aspen Computers. How to use the microcomputer in in your business and home. The speaker will discuss the functions as they apply to the businessman and how to use the system in your home for recipes and home management and will include the model railroader.

2:00 PM - 2:45 PM
Presented by Information Systems Inc. How to match the peripherals with the computer. This clinic will describe the various displays, printers storage items and other equipment that help make the microcomputer the system of the future.

3:00 PM - 3:45 PM
Presented by Digital Enterprises, Inc. Interested in starting your own business using a Microcomputer? This session will describe how you can get started in the business of computerized portraits and will give demonstrations of how it is done.

4:00 PM - 4:45 PM
Presented by Control Data Corp. How to grow in your computer career through the proper training and planning will be the topic of this clinic given by Len Gingerella of Control Data Corp.

6:00 PM - 6:45 PM
Presented by Chicago Computer Store. If you have read all the claims of various computer ads you will probably be confused. This clinic will describe what to look for and what is involved.

Friday, October 6, 1978
1:00 PM - 1:45 PM
Presented by Aspen Computer. How to use the microcomputer in your business and home. The speaker will discuss the functions as they apply to the businessman and how to use the system to control lights and lawn sprinklers in the home. It will also show how a model railroad may be controlled.

3:00 PM - 3:45 PM
Presented by Chicago Computer Store. If you have read all the claims of various computer ads you will probably be confused. This clinic will describe what to look for and what is involved.

4:00 PM - 4:45 PM
Presented by Houston Instrument. How to generate charts and graphs for the small businessman. This clinic will describe how to put info from old charts into the computer and how to generate new charts, all economically.

6:00 PM - 6:45 PM
Presented by Chicago Computer Center. How to let the microcomputer take over your office problems. This clinic will address the application of the low cost microcomputer system to payroll, accounting and other functions. It will also describe the availability of custom programs tailored for the special job.

Saturday, October 7, 1978
1:00 PM - 1:45 PM
Presented by Digital Enterprises, Inc. Interested in starting your own business using a Microcomputer? This session will describe how you can get started in the business of computerized portraits and will give demonstrations of how it is done.

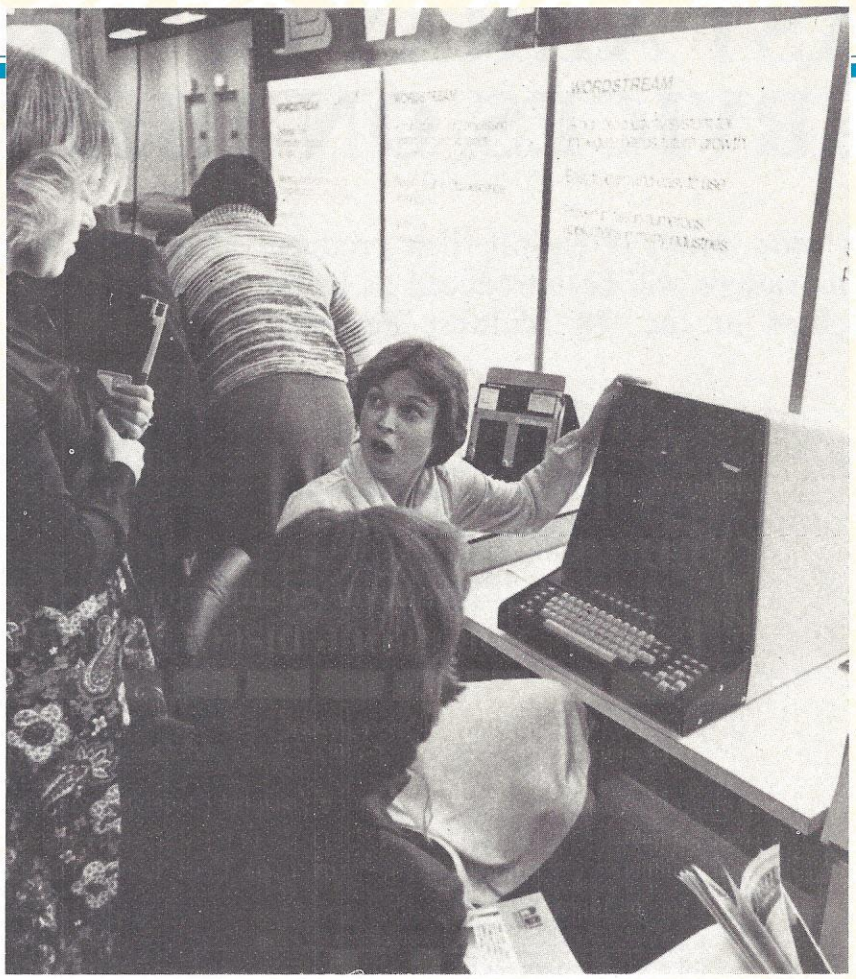
2:00 PM - 2:45 PM
Presented by Information Systems, Inc. How to match the peripherals with the computer. This clinic will describe the various displays, printers storage items and other equipment that help make the microcomputer the system of the future.

3:00 PM - 3:45 PM
Presented by Chicago Computer Center. How to let the microcomputer take over your office problems. This clinic will address the application of the low cost microcomputer system to payroll, accounting and other functions. It will also describe the availability of custom programs tailored for the special job.

4:00 PM - 4:45 PM
Presented by Compucolor Corp. A description of the Renaissance Machine — a full color display personal computer capable of being programmed for games and instructive purposes. A demonstration of the available programs will be given.

Sunday, October 8, 1978
2:00 PM - 2:45 PM
Presented by Compucolor Corp. A description of the Renaissance Machine — a full-color display personal computer — capable of being programmed for games and instructive purposes. A demonstration of the available programs will be given.

3:00 PM - 3:45 PM
Presented by Chicago Computer Center. How to let the microcomputer take over your office problems. This clinic will address the application of the low cost microcomputer system to payroll, accounting and other functions. It will also describe the availability of custom programs tailored for the special job.



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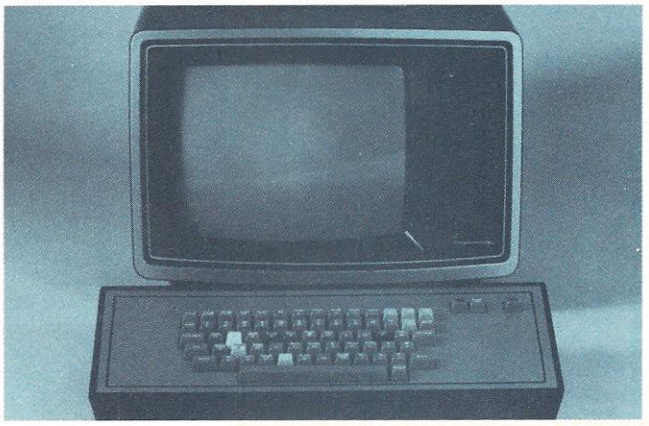
VAST ARRAY OF PRODUCTS, SERVICES ON DISPLAY

A wide variety of exciting new product innovations will be introduced or highlighted at the '78 Midwest Personal Computing Expo. Here are just a few examples:

THE VERSATILE 4 MINICOMPUTER — Computer Data Systems — Exhibited by Michigan General Automation Co.

Boasts a 9-inch video screen with 24x80 display; 8085 CPU; built-in mini-floppy disk drive and controller with 315K storage; 24K static ram memory; 2 serial I/O ports with RS-232 connectors; disk operating system; software library; and 20K extended Basic by Micropolis.



THE BYTEMASTER — The Digital Group

The Digital Group's first completely integrated computer package featuring either 18K or 32K memory, and will support up to 64K of memory if desired. Designed with expansion in mind, this model is fully wired to support various external peripherals. A printer, monitor, and additional cassette, mini-disk or standard disk drives are added simply by plugging to any of four available input/output ports. The unit is dressed in a metal cabinet and is mounted on a metal yoke.

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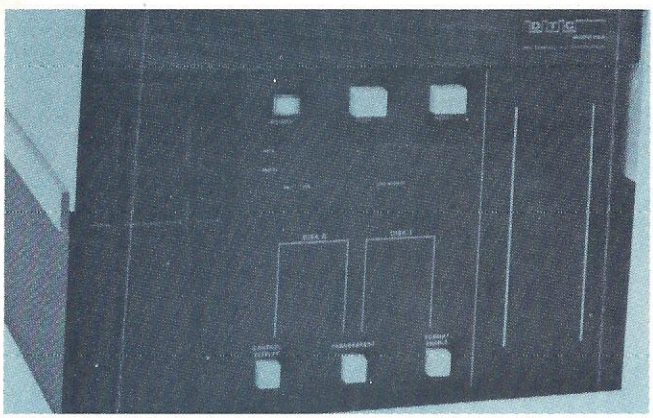
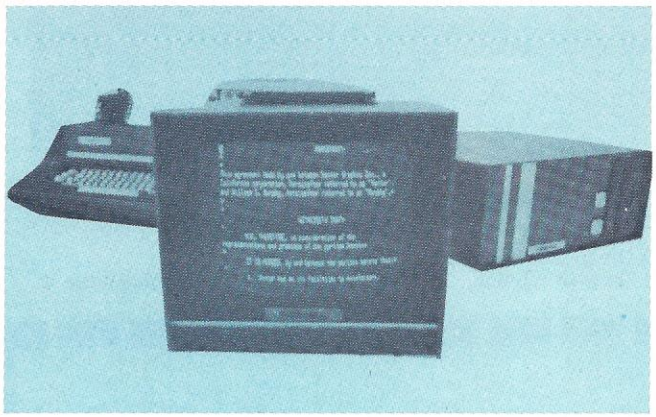
T-48C FULL-DUPLEX I/O PRINTING TERMINAL — Telpar, Inc.

A new, low-cost printing terminal for use with all popular microcomputer systems. The printer is a 48-column, self-contained, ASCII-coded device using a single-chip microprocessor as the system interface and controller. This model operates interactively, printing one character at a time as characters are received with a through-put rate of 24 characters per second. The keyboard has both Teletype and typewriter capability and when interfaced to the printer, results in a full duplex, I/O terminal with bit serial input and output.



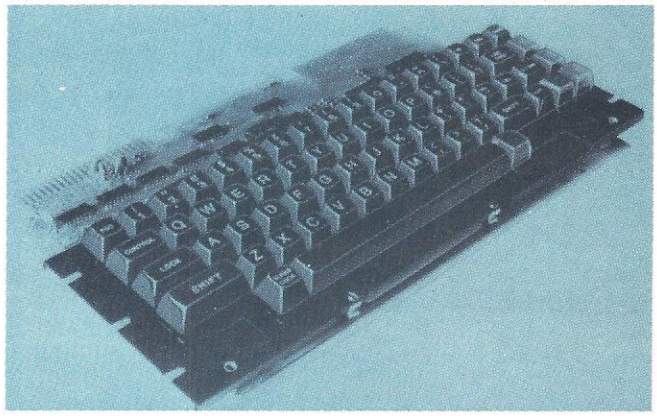
THE DTC MICRO-FILE — Computer Electronic Modes

Offers flexible, cost-saving performance for the data terminal user. Interfacing with any RS-232 compatible data terminal results in a stand-alone business system or intelligent terminal. And, by incorporating a micro-computer, a dual flexible disc drive and a random access memory, the DTC MICRO-FILE can serve a myriad of user applications. Additionally, when combined with a high-print quality device, this model and the printer make an efficient word processing system. Control is provided through a set of system commands issued either from a host time-share system or data terminal keyboard.



MEMORITE WORD PROCESSOR/Vector Graphics Exhibited by Nabih's, Inc.

A word processor and microcomputer with a 24K memory capability expandable to 64K. Utilizes the Diablo printer Hyterm 1620 and the Shugart drive. Nabih's, Inc. is exclusive distributor for Illinois and will be appointing local dealerships from contacts made at the show.



"PRO" KEYBOARD — Cherry Electrical Products Corp.

This all-new keyboard is specifically designed for personal computer, hobbyist and OEM users who don't want to work around a totally dedicated unit. Features include an unique alpha lock key that changes output from type-writer to teletype code, five unassigned (non-dedicated) relegendable keys and an overall design for easy piggyback to a "daughter" board and for do-it-yourself customizing.

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Chicago's newest and most convenient show center, the Merchandise Mart's Expocenter, will host this year's Midwest Personal Computing Expo.

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Children 10 and under are admitted free when accompanied by an adult.

*Admission price entitles you to see all the exhibits and the special "how-to" clinics.

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LOOKING FOR THE NEW KENTUCKY FRIED CHICKEN OR McDONALD'S? JUST OPEN YOUR EYES!

Back in the fifties, if someone had suggested you invest in a hamburger stand called McDonald's or a chicken store run by Colonel Sanders, you probably would have laughed. Most of us did. The few who didn't, and invested in KFC or Big Mac are millionaires today. They enjoy "finger lickin' good" profits and "have it all done" for them.

The whole trick to investing in your own business is to **keep your eyes open for something like a KFC or McDonald's**. A business that (1) requires a **small investment** that can be recouped quickly, (2) has an **enormous profit margin**, and (3) has great growing **consumer acceptance.**

There is such a business.

The business is computer portaits, and it's one of the hottest, most profitable new ideas around. International Entrepeneur's Magazine stated that there are locations that are currently grossing **from $2,000 to $4,000 a week**. Imagine, grossing up to $4,000 a week from a small investment.

that gives you **your own high volume, all cash business.** No franchise fees or royalty payments, **all the money is yours**.

Computer Amusement Systems, Inc., (CASI) of 11 West 20th Street in New York City, has taken today's hot trends—T.V., computers, and instant pictures and combined them to produce a computer portrait system that is high in quality, low in price, portable and **requires absolutely no photo or technical experience.**

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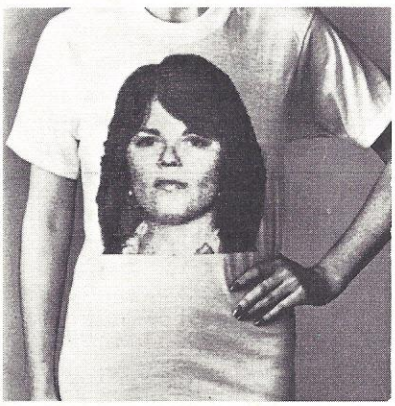
And there's more. You can transfer the portraits instantly to **many high mark-up, big profit items**—tote bags, T-shirts, calendars, puzzles, dart games—whatever the latest trend might be. CASI supplies the wholesale sources for everything you need to be in on the profits.

And there's more. Like special options that allow personalized messages to be printed right on the computer portrait. Or programs that will print out personal bio-rhythm charts in seconds. **All big moneymakers**.

So open your eyes to the most dynamic, profit making opportunity of the year. **Perfect for part time, full time, family operation or absentee management**, CASI is your ticket to success. Start putting money in your pocket today with CASI computer portrait systems. Don't send money just write for details. We'll send them right away.

Before you make an important decision in this exciting new business, know who you're buying from. We suggest you ask your banker about us.



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P

CIRCLE 19

A Roumanian rhapsody

. . . The Roumanians have always been noted for their loving interest in gypsy music, rhapsodies and hot pastrami. Now, they have emerged as the newest nation with a chess-playing computer. Interest is so great in the country that an ongoing match between the computer and readers of a leading Roumanian newspaper is published weekly at the slow rate of one move per week. Mr. U. Friedberg of Bucharest, explains this public match in greater detail in his letter and enclosed clipping: "I am interested in computer chess and am writing a book on adventures of chess in the land of computers. I have read a lot about Chess 4.6, the Greenblatt program and others and am seeking more information on all their activities. I enclose an English translation from a Roumanian newspaper which concerns a chess game between the readers of the newspaper and the first Roumanian computer-chess program. The game is going on, currently, and has attracted a lot of interest." Mr. Friedberg's clipping (English translation) from the paper follows:

Computer Felix C-256 Plays Chess!

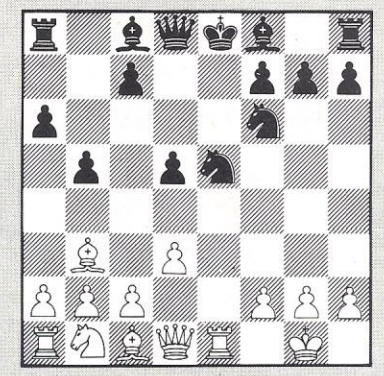
"An unusual game of chess has begun in Romania: the Romanian computer **Felix C-256** plays against the readers of the **Magazinul** weekly! The game is followed not only by chess players but also by experts in computers, specialists in articifical intelligence and psychologists.

"The unfolding of the game is very simple. The readers of the magazine have been given the whites and have been invited to send their move until Wednesday. The move which gets a majority of 'votes' is fed to the computer on Thursday. **Felix C-256** answers on the same day and his answer is published in the Saturday issue of the magazine. Nine moves have been made so far: 1. e2–e4, e7–e5; 2. Ktgl–f3, Ktb8–c6; 3. Bf1–b5, a7–a6; 4. Bb5–a4, b7–b5; 5. Ba4–b3, Ktg8–f6; 6.0–0, Ktf6:e4; 7. Rf1–e1, d7–d5; 8.d2–d3, Kte4–f6; 9. Ktf3:e5, Ktc6:e5.

"The chess programme has been worked out by mathematician Viorel Darie from the Bucharest Institute of Computing Technique and has been called **Astro-64**, a name which suggests both the astronomic number of calculations made by the machine for one move and the 64 squares of the chessboard. **Astro-64** is the first Romanian programme enabling a computer to play chess and it marks Romania's joining what a foreign informatics scientist once called the still limited "club of the countries in which such programmes have been designed

"So far, Viorel Darie has invested in **Astro-64** about 600 of his leisure hours in the last two years. It is interesting that he has worked out the programme without being a passionate chess player. Interested in the mathematic theory of games, he simply found chess to be the most appropriate domain in which he could verify some of his ideas. That is how **Astro-64** was born.

White: **Romanian Readers**
Black: **ASTRO-64**



Position after Black's 9th move

1. e2-e4	e7-e5
2. Ng1-f3	Nb8-c6
3. Bfl-b5	a7-a6
4. Bb5-a4	b7-b5
5. Ba4-b3	Ng8-f6
6. 0-0	Nf6xe4
7. Rfl-e1	d7-d5
8. d2-d3	Ne4-f6
9. Nf3xe5	Nc6xe5

"What is the performance of **Felix C-256** as a chess player? It is quite difficult to answer in a few words. It computes very rapidly – about 10,000 positions per minute. Sometimes it makes good or excellent moves. It even found once the move with which the great master Florin Gheorghiu began a spectacular combination in a game with an English master! But other times it makes poor, 'uninspired' moves or even beginner's mistakes. As another master said, in such situations it behaves like an 'uneducated chess player.'"

U.VALUREANU

If you would like to join this Roumanian public chess-match against the **Felix-256** computer, enter your next 4 moves here, together with how you think the computer would respond to your moves. It appears that the computer is about to lose a knight and be checked at the same time. And if Felix doesn't watch out, White's Queen is apt to move into the vacant e1 spot to line up a strong early attack on the Black King and scare the living daylights out of the computer. "But don't be fooled," writes our Roumanian correspondent. "Felix is like a smart cat and may be laying a trap for some unsuspecting mice." More on the contest next month if we can maintain our communication lines with Roumania. Meanwhile, try your chess skill for the next four moves and you will eventually find out how you would have fared if you lived in Bucharest:

10._____ _____

11._____ _____

12._____ _____

13._____ _____

Etiquette of chess

. . . Dennis E. Hamilton, of Penfield, NY, plays chess, is developing his own computer chess program and who is concerned with the rules of computer chess, has been kind enough to send

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along some pertinent observations. Donald's first order of business concerns the USCF registration of programs: "In order to allow legitimate scientific testing of chess-playing computer programs," he writes. "The USCF has established procedures for registration of programs and participation in USCF-rated tournaments. To maintain statistical utility of the player rating system employed in the United States, it is necessary that modifications of existing programs (including operation on a different computer system resulting in a change of program performance) be re-registered. It is unclear how this proviso is to be accommodated for programs that exhibit learning behaviour." This particular point was brought out sharply at the Toronto tournament last Fall. Kaissa, the champion from Russia, had to reprogram itself into a loaned IBM 370, courtesy of Canada Systems Group, Toronto. It eventually finished in second place. The question raised at that time, to which there can only be a hypothetical answer, was how would emerging champion Chess 4.6 have fared if it had gone to Moscow and had to borrow a Russian computer there for re-programming? It is a moot point that will have to be resolved someday. Procedural information on how to register a computer program for tournament play are available from USCF, 186 Route 9W, New Windsor, NY 12550. The second order of business brought up by Dennis concerns Martin E. Morrison's new "Official Rules of Chess" published by David McKay, NY 1978. "One of the topics treated in that book," says Dennis. "Is the USCF section on 'Suggested Rules for Play Involving Computational Machinery.' These rules should be accomodated, along with overall rules of chess, by programmers who desire to enter their algorithms in USCF-rated events. Another aspect is the uniform adoption, *world-wide*, of the abbreviated algebraic notation. On January 1, 1981, this becomes the authorized notation for recording moves during tournament play. Designers of chess-playing programs would do well to accommodate this scheme at once." The third order of business from Dennis' critical analysis concerns a particular article in the book of rules. "Article 12.3 of the Official (FIDE) Rules of Chess presents one of the most interesting challenges to the formulation of chess-playing computer programs," observes Dennis. "That challenge involves the correct recognition of a repetition of the position. Under most circumstances, a repetition of the position is determined by the same player having the move together with an identical arrangement of pieces on the board. But Article 12.3 is more stringent than that: the possible moves of all the pieces must also be the same from each occurence of the arrangement. The only factors influencing possible continuations and not determinable by inspection of the board alone are, of course, the right to capture a pawn *en passant* and the rights to castling that may remain to either player. (Of course, it is evident in many positions that no such rights can possibly exist.)

"Would KAISSA be the world's champ today, if CHESS 4.6 had gone to Moscow and used a Russian computer?"

"Is it sufficient, then, to keep track of the 'forward' preservation of castling rights along with incidences of pawn advances that satisfy the conditions for capture *en passant*?

"Perhaps not.

"What happens in the event that an earlier position is identical in all respects but for the presence of certain rights *and there is no way for such rights to be exercised* in any legal continuation from the original position?

"If you want to ponder this question, try setting up a position in which an *en passant* capture cannot be exercised because the only pawn in a position to make capture is pinned in front of the player's king. Now consider player's king being in check by other than the just-advanced pawn.

"*En passant* isn't too difficult to verify, of course, because the right is a fleeting one in any case. Unexercisable castling rights are of another breed altogether. What, I wonder, is the least upper bound on a continuation tree before it is determined that a right to castle is unexercisable in every possible continuation? This problem is not confined to computer chess by any means. Tournament referees may have a devilish time correctly arbitrating a draw claimed under Article 12.3 if the claim hinges on the assertion that a right to castle remaining in an earlier position was, in fact, no right at all!

"The United States Chess Federation has been queried on this subtlety, and the FIDE Rules Commission will be asked to consider the question. In the meantime, it may be prudent to make sure our programs aren't suckered into repetitions because they are a bit too hasty at concluding that a difference in rights is sufficient to make the positions differ."

Historical Notes

(Brief extracts and comments on computer-chess development from 1941 to present date.)

. . . From a *1968* paper titled "A Five Year Plan for Automatic Chess" by Dr. Jack Good, currently at Virginai Polytechnic Institute at Blacksburg, VA.:

Young animals play games in order to prepare themselves for the business of serious living, without getting hurt in the training period. Game-playing on computers serves a similar function. It can teach us something about the structure of thought processes and the theory of struggle and has the advantage over economic modelling that the rules and objective are clear-cut. If the machine wins tournaments it must be a good player.

The complexity and originality of a master chess player is perhaps greater than that of a professional economist. The chess player continually pits his wits against other players and the precision of the rules makes feasible a depth of thinking comparable to that in mathematics.

No program has yet been written that plays chess of even good amateur standard. A really good chess program would be a breakthrough in work on machine intelligence, and would be a great encouragement to workers in other parts of this field and to those who sponsor such work.

In criticism of the writing of a chess program, D.K.C. Macdonald (1950) quoted a remark to the effect that a machine for smoking tabacco could be built, but would serve no useful purpose. The irony is that smoking machines have since been built in order to help research on the medical effects of smoking. This does not prove that a chess program should be written, but suggests that the arguments against it might be shallow. Many branches of science, and of pure and applied mathematics, have started with a study of apparently frivolous things such as puzzles and games.

It is pertinent to ask in what way a good chess program would take us beyond the checkers program of A.L. Samuel (1959). The answer is related to the much greater complication of chess, the much larger number of variations and possible positions. In fact, the number of possible chess positions is about the cube or fourth power of the number of possible checkers positions (13^{64} for chess, 4^{32} for checkers). Samuel was able to make considerable use of the storage of thousands of positions that had occurred in the previous experience of the machine, and this led to a very useful increase in the depth of analysis of individual positions. The value of this device depends on the probability that, at any moment in the analysis, we run into a position that has already been analysed and stored. If the expected number of previously analysed and stored positions on an analysis tree exceeds unity, then the expected *effective* number of positions on the tree is infinite! This remark is of course based on an oversimplified model, as is clear since the total number of possible chess or checkers positions is finite. The remark is also somewhat misleading, since an 'infinite' tree might be deep at the wrong place; but it does give a little insight into the effect of storing positions. Whereas it is useful to store thousands of positions in checkers, in chess it would be necessary to store millions or billions of positions in order to gain a comparable advantage. Presumably the main advantage of storing positions in checkers accrues from the opening and early middle-game; and in chess, by storing millions of positions, the machine could gain an opening advantage. Apart from this, I have believed for a very long time that a good chess program would need to make use of essentially the same methods as those used by men. The difficulty, the interest, and the challenge is to formalise exactly what it is that men do when they play chess.

The more the program is based on the methods used by humans the more light it will shed on the nature of thought processes. But for the sake of a clear-cut objective I should like to

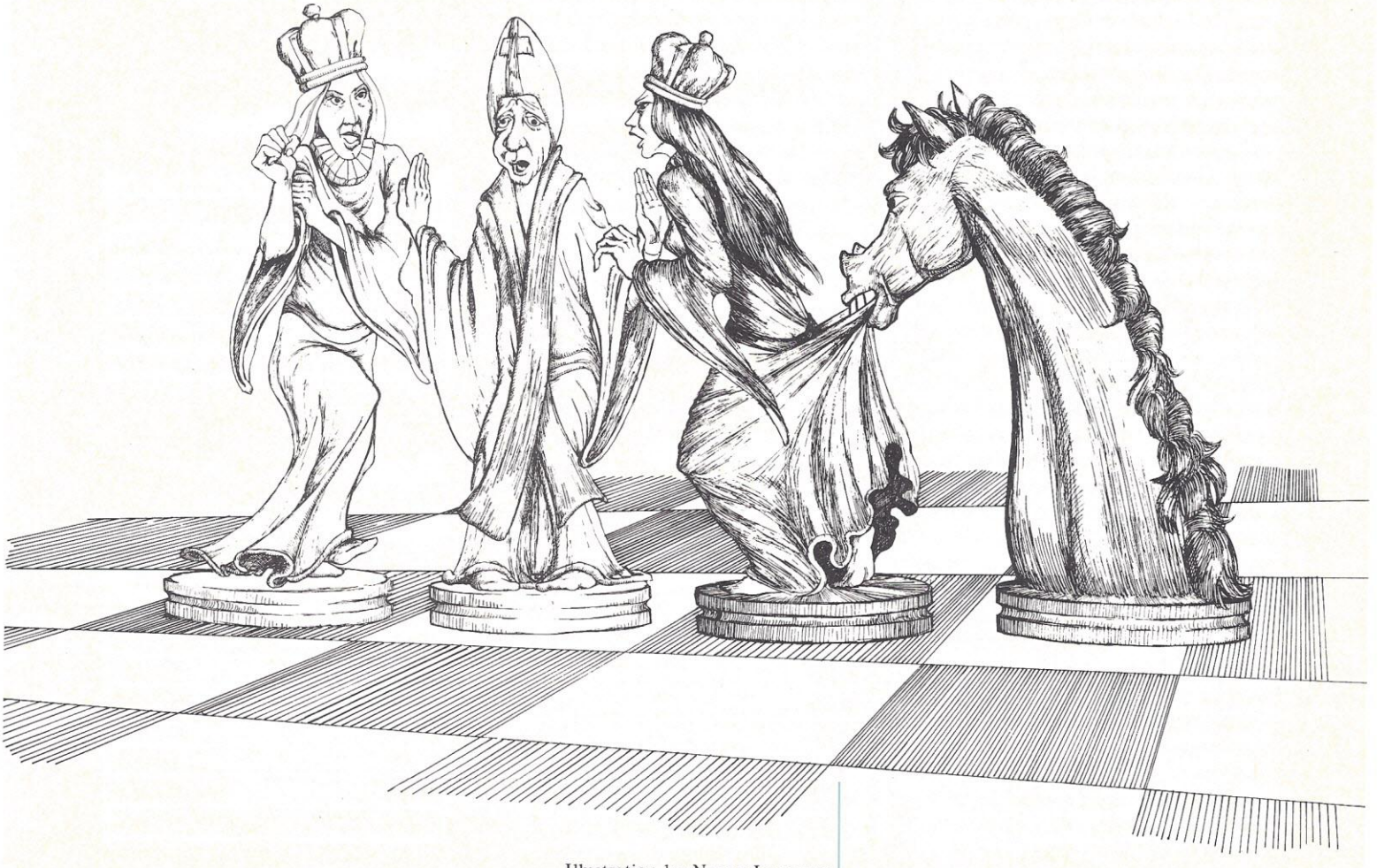


Illustration by Nancy Lawrence

write a program that wins games.

When a man plays chess, he does often recognise situations that have occurred before, but these situations are seldom complete positions, except in the opening and very late end-game; rather they are features of the position, or patterns embedded in it. Thus chess provides an example of pattern recognition, whereas checkers does not to much extent. Nevertheless, several of the techniques used by Samuel should be incorporated.

Chess also provides a better example than checkers of the use of associative memory, since any given position is associated with many situations that have occurred in the chess player's experience. These associated situations suggest strategic or tactical ideas to the player, the strength of the suggestions being dependent on the strength of the associations.

An example of a pattern is when White's king has three unmoved pawns in front of it in the late middle-game or early end-game. This pattern is recognised by every experienced chess player as potentially dangerous, in that there is the possibility of a mate by a rook or queen on the back line, even in conjunction with a sacrifice. *One* analysis of the position will then be performed with this theme in mind. This applies more generally to the goals and subgoals that occur to the chess player. Thus there should be 'specifically-directed' as well as 'routinely-directed' analysis.

Another important aspect of chess thinking, also required in most other problem-solving, is what de Groot (1946, 1965) calls 'progressive deepening' of an analysis. Typically an analysis of a position by a human player does not simply follow a tree formation, but contains cycles in which a piece of analysis is retraced and improved. Also a player continually formulates subgoals and subsubgoals and continually modifies them. In these respects again chess provides a better example than checkers.

As every philosopher and programmer knows, it is not easy to formalise human thought. In fact, when we say that a man has made a judgement, we imply that we do not know in detail how he did it, and this is so even if that man is ourselves. This aspect of judgements is not yet mentioned in dictionaries. The work on automatic chess therefore started when men, such as the musician-chess player Philidor (1749), formulated general principles of play. Many of these principles have become embodied in chess slogans or cliches that need to be taken into account by the programmer.

Many of the principles of chess are expressed linguistically rather than numerically. This is much more typical of chess, and many intellectual activities in ordinarly life than in checkers. Thus chess provides a good field, with a limited vocabulary, for those who are working on language handling by computers.

Chess programming can also be justified as sport. £500,000,000 are spent on football pools in the United Kingdom in five years, and each pound must correspond to several hours of study. Further, hundreds of millions of man-hours are expended in watching the game. The expenditure on chess programming will be microscopic in comparison.

—Jack Good

Valenti's chess program

. . . Mike Valenti's thesis on the mechanics of writing a computer-chess program continues with data structure:

"Data Structure is generated for every position that the computer evaluates in the game tree generation (look-ahead) process. It contains basic information about the position that is later referenced by the plausible move selection routine. This data structure is stored in 4,000 8-bit bytes of storage. The "developmental value" referred to here, is detailed later in the thesis.

"Graphically, this chess data structure is shown in Fig. 1.

"The data structure as shown is implemented with the 'RECORD' facility in BLP (further detailed in a later section.) These 'RECORD's are not allocated, but are used as templates over an allocated vector. The area in the vector is referenced by a pointer that is used in conjunction with these 'RECORD's This allows meaningful names to be used in referencing the data, instead of meaningless vector subscripts.

"An example is given here using the 'RECORD's for the data structure shown in the tables here. The 'RECORD' is declared as follows:

Figure 1

Chess Position Data Structure

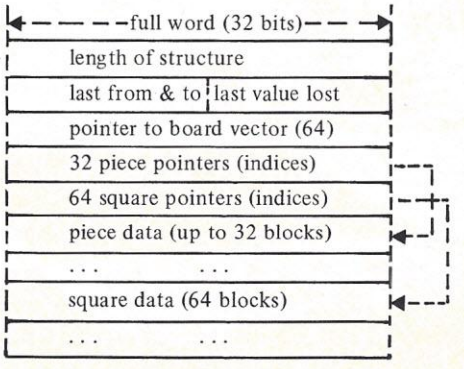


Figure 2

Piece Data Blocks

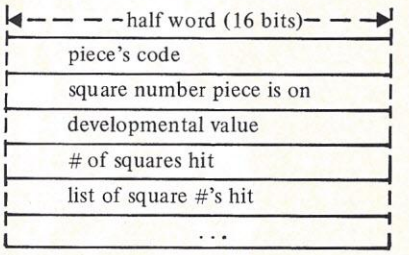


Figure 3

Square Data Blocks

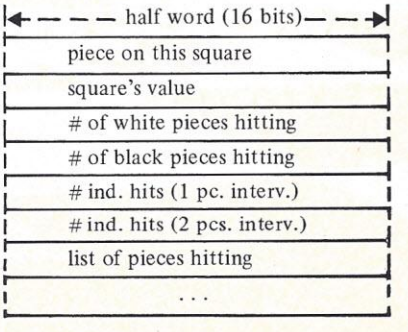


Figure 4 Implementation of Data Structure

```
cds RECORD                      /* chess data structure */
    length FIXED,               /* in bytes, of the structure */
    lastmf BIT (8),             /* last move's from square */
    lastmt BIT (8),             /* last move's to square */
    last_value BIT (16),        /* value lost on last move */
    bvp POINTER,                /* ptr to board_vector */
    piecep (32) FIXED,          /* indices to pieces' data */
    squarep (64) FIXED,         /* indices to squares' data */
    data (100000) BIT (16)      /* piece & Square data indexed by the above */

END
```

```
pds RECORD                      /* template for piece data */
    pcode bit (16),             /* piece's code */
    sqocc BIT (16),             /* square occupied */
    deval BIT (16),             /* developmental value */
    #ad BIT (16),               /* # of squares attacked or defended */
    sql (100) bit (16)          /* List of squares #'s hit;
                                   square # = square # +
                                   0 if no piece on it,
                                   100 if defending and
                                   200 if attacking */

END
```

```
sds RECORD                      /* template for square data */
    ponsq BIT (16),             /* piece on this square */
    svalue BIT (16),            /* square's value */
    wad BIT (16),               /* # of whites hitting */
    bad BIT (16)                /* # of blacks hitting */
    hit 1 BIT (16),             /* # of indirect hits, with one piece intervening */
    hit 2 BIT (16),             /* # of indirect hits, with two pieces intervening */
    wbl (100) BIT (16)          /* list of pieces hitting */
END
```

"The last line of each 'RECORD' is a large dimensioned vector. Since these are not allocated, but used as templates, it doesn't matter what the dimension is.

"The data can be referenced by using pointers and this 'RECORD' as the templates. The pointer 'P' points to the start of the entire structure (see figures 2 to 4.) Here is an example showing the assignment of 'some_piece' number's developmental value to the variable 'x' (see later Appendix for details on use of pointers).

```
x=P@CDS, DATA (P@CDS. PIECEP
(SOME_PIECE#) +2; ("DEVAL is
offset two BIT (16) entries from
the start of PDS RECORD)
```

Alternately, using the pointer PTP, the data can be referenced thus ("ADDR" gives the address of the argument):

```
PTP = ADDR (P@CDS. PIECEP
(SOME_PIECE #) ) );
x = PTP@PDS.DEVAL;
```

"In addition to this data structure, some tables and vectors are set up for quick reference to certain items such as the square number of a piece number or the piece number on a square." (This discussion on data struture, continues in next month's issue.)

Tidbits of information and chess chatter

. . . Sargon, winner of the San Jose Microcomputer Chess Tourney, is reportedly coming out with Sargon II, a stronger version of the original program. . . . CYBERCHESS, a new chess-playing "machine" that is not a machine at all and uses no electricity, is manually operated by inserting pre-programmed cards into the gadget and manipulating these cards to reveal player's or "machine's" next move. Rating-levels of cards are graded from 900 to 2200 and the "machine" is claimed to be a means of improving your game of chess. For more information write to Cyber, PO Box 2066, Cerritos, CA 90701. Basic price is $29.95 to which must be added handling charges plus applicable sales tax. . . . Logical Systems, PO Box 303, Minneapolis, MN, 55440, manufactures "CompuChess." This computerized chess-game finished in 9th place at San Jose's Microcomputer Chess Tourney in March of '78. It uses an F8 microprocessor (same as Boris and Chess Challenger) and has 2K ROM and ¼K RAM (compared to Chess Challenger's Leve II 4K ROM and ½K RAM.) CompuChess is available at around $170 direct from factory. It plays at 6 levels, solves mate-in-two problems and serves as an excellent teaching aid for children and adults, says the manufacturer. A note to above address will bring complete information on CompuChess and will explain its capabilities in more detail. . . . Microchess-1.5 cassettes were originally conceived as Microchess-1.0 programs which would play reasonably good games of chess using a minimum of computer hardware. The taped programs are written in Z-80 machine language and are designed to make optimum use of the features of the TRS-80 microcomputer. Each of the new upgraded programs is a full 4K bytes in length and includes a graphics driver to display the chess board on a video monitor. "Microchess-1.5," says Mirco-Ware Ltd., its manufacturers, "is a tireless opponent. It is always ready for a quick blitz game or a slow thoughtful one. It is ready at any time to assist you in learning to play chess, or to help you practice chess skills." For more information on program cassettes, drop a note to Micro-Ware Limited, 27 Firstbrooke Rd., Toronto, Ontario, Canada, M4E 2L2. . . . Software Specialists announces a computer chess program for 8080 and Z-80 based microcomputers. This assembly language program conforms to all rules and conventions, says the company, including castling, *en passant* captures and promotion of pawns. The entire program, including I/O routines, will run in 8K of RAM. For users with a

North Star system, the program on disk uses the DOS I/O routines. The program is also available on paper tape with a 256-byte block reserved for the user's I/O routines. Price of the program in either form is $35. For more information contact Software Specialists, PO Box 845, Norco, CA 91760.

. . . Doug Penrod has alread tangled with this newly announced game and sends this note: "Can't see how to start the Software Specialists' game at an arbitrary board setting. Also, for the Teletype, it would be nice to be able to suppress printing the board every time the program moves." . . .

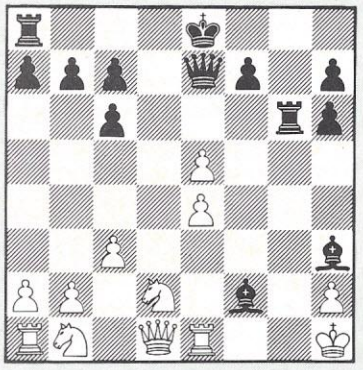
Chess Challenger "10" is the new, upgraded model of computerized chess from Fidelity Electronics of Chicago. Challenger "10" become the big brother of Challenger 3, which has been on the market for several years. The new machine gives players a choice of 10 different playing levels from "beginner" to "tournament practice on the expert level," says the manufacturer. Fidelity also claims that Chess Challenger 10 analyzes as many as 3,024,000 board positions, offers endgame problems of "mate in two" and permits the playing of "chess by mail." Whether or not Chess Challenger 10 does indeed exercise these talents during actual competition, will be learned after chess players have had a crack at it. Also upcoming will be a judgement on its rating .

. . . BORIS, also, has recently been upgraded to reflect a 40% increase in playing speed. Available only since last Fall Boris has become a popular competitor to the other computerized chess games. In the improved mode, the manufacturers, Chafitz, Inc. of Rockvill, MD, expects BORIS to do even better. Mark Singer, in a report on BORIS in American Postal Chess League, says "BORIS plays well enough to be real competition for any beginner, or for any average player willing to wait 30 minutes or so for BORIS to move. At this speed Boris plays at about 1450-1550 level. At longer times, he could be competition for anyone short of expert rating!"

Chessboard fray at San Jose

. . . One of the games at San Jose's microcomputer tourney involved Processor Technology vs. Sargon. The microprocessor used by Sargon was a Z-80 with 8K RAM; Processor Technology had an 8080 also with 8K RAM. Moves of that game have been annotated by Alan Benson, ICCF Postal Chess Master:

White: **Processor Technology** Black: **Sargon**



Position after Black's 13th move. At this point Alan Benson, in his annotations, observes that Sargon could have mated in 4 by commencing with a Bg2 check for his 13th move.

1. e4	e5	7. Bh6: (b)	gh:	17. Na 3	Qe5:
2. d4	Nc6	8. Bb5	Rg8 (c)	18. Qe2	Rg2 (h)
3. de:	Bb4+	9. Bc6:	dc:	19. Nf3 (i)	Qe6
4. c3	Bc5	10. 0-0	Bh3	20. Qe1	Bc5
5. Nf3	Qe7 (a)	11. Nd2 (d)	Rg2:+	21. b4	Ra2:
6. Bf4	Nh6	12. Kh1	Rg6	22. Bc:	Bg2+
		13. Re1	Bf2: (e)	23. Kg1	Bf3:
		14. Rg1	Bg1:	24. Ra2:	Qa2:
		15. Nc4	Rd8	25. Qf2	Rd1+
		16. Ncd2	b5 (g)	26. Resigns	

Annotations by Alan Benson

(a) A good method here is 5 . . . Nge7 followed by Ng6 and Qe 7 as in the Budapest Defense.
(b) Here 7. h3! preventing the knight from moving to g4 was much better.
(c) Why not simply 8 . . . Ne5:?
(d) 11. Nel was correct. After 11 . . . Qg5 12. Qf3 holds everything.
(e) Sargon misses 13 . . . Bg2+ 14. Kg1, Bf3+ 15. Kf1, Rg1+! 16. Kgl:. Qg5+ 17. Kf1, Qg2 mate.
(f) Here 16. Qe2 developing a piece was to be preferred.
(g) Why?
(h) Overlooking 18 . . . Rd2:! for if 19. Qd2:. Qe4:+ 20. Qg2, Qg2: mate.
(i) An amazing defense. Protects the mating square h2 and also attacks Sargon's queen.

Computer beats U.S. chess champ

. . . The following game between CHESS 4.6 and Walter S. Browne, U.S. Chess Champ for the past 3 years, was part of a 44-board simultaneous exhibition by Browne sponsored by Minnesota Chess Association. One of the boards was program CHESS 4.6 written by Dave Slate and Larry Atkins of Northwestern University. Operating the computer CDC Cyber 176 during the game was Dr. David Cahlander, computer-programming consultant with Control Data Corp. He was assisted by John Douglas and Paul Higgins both of whom are also with Control Data. The

game between Browne and the computer which was run in May of this year was received from Dave Cahlander. Chess Life and Review, earlier, ran the game in its July issue.

The organizer of Minnesota's Twin Cities Open invited Northwestern's CHESS 4.6/Control Data's CYBER 176 to take part. Since this World Champion Computer System had not been tested in open human condition, its programmers readily accepted the invitation. With a rating of 1936, CHESS 4.6 was seeded number one in the five-round Swiss, perhaps the first time a computer has been accorded that position.

A new electronic chessboard was used for the first time. The microprocessor which controls the board senses the opponent's moves magnetically, transmits the move in algebraic via telephone to CYBER 176, and then indicates CYBER 176's responses by illuminating small lights on the square of the piece to be moved and on the one to which it is to go. Chesstor, as this device is called, also senses the hitting of the chess clock

CHESS 4.6 did very well in this event, wrapping up first place in four rounds and finishing the tournament with a perfect 5-0 result. The 30 to 35 points gained bring its rating close to the elusive Expert barrier. This win carried with it an invitation to enter U.S. Champion Walter Brown's simultaneous exhibition.

A large crowd gathered to listen to GM Browne lecture and to watch his 44-board simultaneous exhibition. Asked his opinion of computer chess. Browne replied that he did not mind their slow style of play. Browne invited wagers on his computer game and was surprised to find takers in the audience. Later he declined the side bets, saying that although he would win, the time he spent at the computer's board would not be fair to the other players.

GM Browne's 1978 tour had thus far produced an amazing winning streak, with only 2 losses and 6 draws in 17 exhibitions. As this exhibition began, everyone was amazed at Browne's pace around the first six circuits: he barely paused at each board before responding to the positions before him. He certainly did not seem concerned about the computer's Benoni, which requires sharp and exact play. (Later Browne acknowledged that he should have spent more time with this opening.) Browne did, however, appear to be perplexed by the computer's advantage out of the opening, and this put an end to his making blitz-mode moves at the computer's table. Here is the way the game went.

Chess 4.6 vs. Walter Browne

Benoni Defense

W. Browne **Chess 4.6**

1 P-Q4 N-KB3 2 P-QB4 P-B4 3 N-KB3 PxP 4 NxP P-K4

CHESS 4.6 tends toward sharp opening play.

5N-N5

Walter Browne tends toward sharp opening play.

5 . . . B-B4

CHESS 4.6 has been modified for this event to allow the operator to wait until the visiting GM arrives before requesting the computer's move. This gives the system maximum time for computation.

6QN-B30-0

Browne's Knight move brings 4.6 out of the opening book. At this point CHESS 4.6 has used 2 minutes and Walter Browne has hardly broken stride as he passed. But now the skid marks in front of the electronic chessboard are added to each time Browne passes by.

7P-K3P-Q3 8B-K2P-QR3

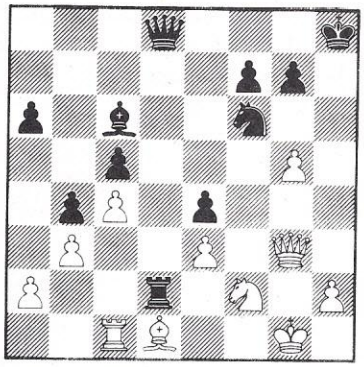
The chessboard seems to flicker with electronic pride as the machine's estimate of its advantage climbs to more than one-half pawn – more than one-half a grandmaster's pawn.

9N-R3 N-B3

Browne's charming wife spent a lot of time watching the computer and was dismayed as with each successive move the computer's evaluation routine gave a stronger and stronger pro-computer assessment of the position.

10N-B2 B-B4

CHESS 4.6 is predicting Browne's moves with impressive accuracy, and



Position after White's 36th move. At this point, CHESS 4.6 did its deepest thinking of the whole game. It examined 2,158,456 positions before making the next move. Time required for this lengthy tree search was 9 minutes, 20 seconds.

it gets about 4 minutes per move in which to thwart Browne's design for the game.

11 0-0

4.6 expected N-Q5.

11 . . . Q-Q2

Still retaining a one-half-pawn lead and expecting 12 B-Q3 P-KR4 13 N-Q5 N-KN5 14 P-K4.

12 P-QN3 K-R1 13 B-N2 R-KN1

4.6 is having trouble finding something to improve the position. It predicts 14 Q-Q2P-R3 15 QR-Q1 N-K5 16 NxN BxN.

14 N-R4 B-R2

4.6's position seems solid now.

15 B-R3 P-R3 16 R-B1

[Not 16 BxP? BxN – Ed.]

16 . . . QR-Q1(expecting Q-Q2) **17 N-N4 NxN 18 BxN**

All anticipated by 4.6. At this point the 4.6 corner fell prey to a bit of mild panic and requested the next move about 3 minutes before Browne was due back at the board. The new electronic chessboard seemed not to have sensed the previous move (which indeed it had), and in the flurry of the operations following, CHESS 4.6 committed its only error.

18 . . . Q-B2

There may be a stronger move.

19 Q-K1

Now 4.6 is only one-quarter pawn up, but it thinks 19 Q-Q2 would have been more to the point.

19 . . . B-B4 20 B-KB3 B-Q6

One-half pawn up again. Computer fans could relax a bit. Both 4.6 and Browne see the next four moves now. Browne spends a lot of time at our table; Mrs. Browne spends a lot of time warning Walter that he should spend a lot of time at our table. She asked

how much the machine cost and was told several million dollars. She told Walter that the machine said it had the advantage. Browne was not impressed, although he did start to thumb the pieces and our clock as he passed. After a lengthy stay at the board he played.

21 BxB PxB 22 B-K2 B B4 23 P-B3 P-K5 24 P-B4 B-Q2 25 N-B3 Q-R4

Now the visiting master stops, does a double step, smiles: he's got his thing now. The Queen is out of play. Browne begins a Kingside attack, smiles at the spectators, savors his move.

26 Q-R4

Thump, smile. It's lucky that the electronic board can only sense the position of the piece and not the force with which it is moved, for Browne's forceful play intimidates the spectators.

26 . . . B-B3

For the next four moves, 4.6 must find defensive resources that are not obvious to those in attendance, and predictions of an early end to the game begin.

27 R-QB2

4.6 expected P-KN4.

27 . . . P-QN4

Can Browne be distracted?

28 P-KN4

Doesn't look like he is.

28 . . . P-N5 29 N-Q1 R-Q3

Now everyone sees the defense. 4.6 expects 30 P-N5 N-R2 31 N-B2 KR-Q1 32 B-N4 Q-N3 33 B-B5. Browne plays.

30 N-B2 R/1-Q1

If 4.6 survives, the GM is not going to like what's happening on the Q-file.

31 R-Q1 RxRch 32 BxR

Small thump, walk away, stop, look back, frown.

32 . . . R-Q3

At this point the clocks show 2 hours 44 minutes for 4.6 and 22 minutes for GM Browne.

33 Q-N3 Q-Q1

4.6 correctly projects Browne's game for the next 11 moves.

34 R-B1

Now Browne is defending. Things are not going well at some of the other boards, either, but it is here that Browne spends most of his time.

34 . . . R-Q7

What a nice place for one's Rook.

35 P-N5

4.6 had been expecting this much earlier.

35 . . . PxP 36 PxP N-R2 37 P-N6 PxP

We are a whole pawn up!

38 QxP Q-R5!

Now things start to liven up. Browne looks unnerved and spends a long time on his next move. He gets in trouble at the next board, too. Here he finds

39 Q-B5 B-Q2

4.6's backers find happiness and will admit that they just may have moved the piece more slowly and punched the clock more vigorously than was necessary, so much so that Browne remarked, with just a hint of a smile, "It is not allowed for the computer to play psychologically." 4.6 correctly projects Brown's next 7 moves.

40 Q-B4 QxQ 41 PxQ P-K6

World Champion 4.6 admonishes U.S. Champion Browne to be careful. GM Browne admonishes 4.6 not to be overconfident.

42 N-K4 P-K7

Forcing the exchange of a Bishop for two pawns.

43 BxP RxB 44 NxP B-B1 45 R-Q1 R-K1

Browne now finds a move to make the end-game playable. 4.6 did not anticipate this continuation.

46 P-QR3 PxP

Greedy, but what else?

47 R-R1 P-N4 48 PxP R-K4

Expecting N-R4.

49 P-N4 P-R4

It's a whole piece up.

50 N-Q3 RxPch 51 K-B2 PxP 52 NxP R-QR4 53 K-K3 B-K3 54 K-Q4 N-N4

Expecting 55 N-B6 R-KB4 56 N-Q8 R-B5.

55 N-B2

Browne offers a draw. The computer's corner is divided; do we play on for science or bag a draw with a GM for the record book? Browne returns in less than 2 minutes. Science prevails: 4.6's Bishop and Knight tactics should be interesting.

55 . . . P-R7 56 N-N4 R-R5

The machine records a 5-point lead for Black.

Browne first plays K-B3, hits the clock and moves away; then he skids to a stop, returns, and announces, "That's not my move," stands, leans, sways, taps, pounds on a loose pawn, and finally plays

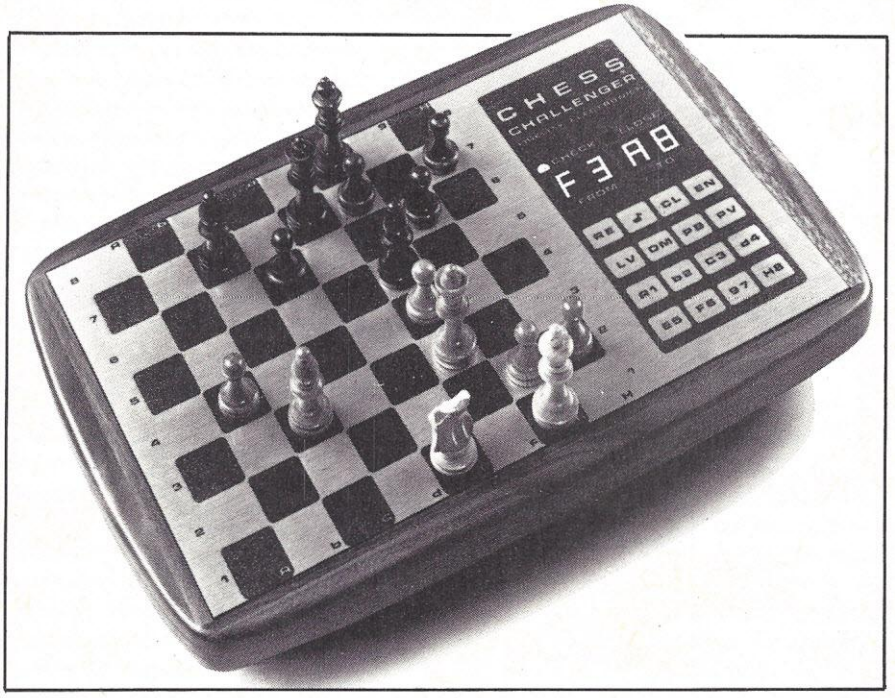
57 K-B5

Browne has missed his last chance at the Rook pawn.

57 . . . N-K5ch 58 K-N5 B-Q2ch 59 N-B6 N-B6ch (the final nail) **60 K-B5 BxN 61 KxB RxPch 62 K-Q6 R-Q5ch 63 K-K5 R-Q8**

And Browne resigns.

In the course of this simul, CHESS 4.6 correctly projected 35 of Browne's 58 moves, not including those from the opening library. In total, CHESS



"Chess Challenger '10' " is the new, upgraded chess-player by Fidelity Electronics of Chicago. It is being entered in matches against other computers as well as humans.

4.6 used just over 4 hours of computation time, whereas GM Browne spent 26 minutes at the board.

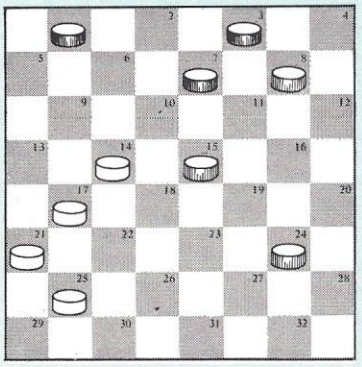
Browne was not pleased with his performance in general; 6 wins and 6 draws were scored against him, dropping his percentage for the day to 73%. But the game CHESS 4.6 played will certainly provide some pleasant moments to those who play over the moves, and they're almost certain to find the computer's style refreshing.

Text by J.R. Douglas
CHESS 4.6 by David Slate and Larry Atkin
Magical Chessboard: David Cahlander
CYBER 176 by Control Data Corp.
SLATE/ATKIN: Northwestern Univ.
Annotation by CHESS 4.6

Computer checkers

. . . W.B. Grandjean, Secretary of American Checker Federation, 3475 Belmont Ave., Baton Rouge, LA 70808, observes that: "In spite of the examples of poor play at checkers by computers, there are machine programs around which have proven highly successful at chess. In California last year, a computer wiped out all five of its opponents to win the Class B chess tourney; it then took on the Class A winner and beat him; finally the Expert Class winner was able to beat the computer only after a 94-move chess marathon. From this example it would seem that computer program developers and research workers have ignored checkers as being too simple! If as much attention had been paid to checkers as to chess, the class of play at computer checkers would be much better. Perhaps good checkers look-ahead to protect or gain material is paramount; positional principle is a far-distant second priority used as a last resort when the position cannot be fathomed. Computers seem to be more accurate at principles than at look-ahead. Following is the second game that Duke University played against Stanford with annotations by ACF Games Editor Dick Fortman."

Black: **Duke**	White: **Stanford**
1. 12-16	24-20
2. 11-15	20-11
3. 7-16	22-18
4. 15-22	25-18
5. 8-11	29-25
6. 4-8	25-22
7. 16-20 (a)	22-17(b)



8. 9-14	18-9
9. 6-22	26-17
10. 2-7 (c)	23-19
11. 5-9 (d)	30-25 (e)
12. 9-14 (f)	27-24 (g)
13. 20-27	31-24
14. 14-18 (h)	19-16
15. 11-27	32-14
16. 10-15	28-24 (i)
17. 15-18	14-9
18. 18-23	17-13
19. 8-11 (j)	21-17
20. 11-15	24-20
21. 15-18	25-21
22. 18-22	17-14
23. 3-8???!!!(k)	9-5
24. 23-26	21-17
25. 22-25	13-9
26. 25-30 (l)	9-6
27. 1-10	14-9
28. 8-11 (m)	5-1
29. 30-25	9-6
30. 10-15	6-2 Black wins.

Annotations by Dick Fortman

Dr. Samuel conceded for White. However, there is considerable play left here with good drawing chances. Black has almost dallied too long. At the end, after 6-2, if 25-21, is followed by 1-6 then the 20-16 shot is a draw. There are other possibilities for draws. There is even a long ending with a probable Black win. (Additional comments by W.B. Grandjean)

a) Standard for both to here. The computers are programmed for good opening play but the mid-game and especially the end-play is poor.
b) Surrenders the attack.
c) 23-18 is stronger, followed by 8-12
d) Again, 11-15 is best. White has nothing better than 17-14 to a draw.
e) Why? Better for White is 17-13.
f) Here 9-13 might force to a draw.
g) An aimless move that loses.
h) Here the Duke computer misses its first win beginning with 11-15.
i) Going into a second loss! The simple 14-10 exchange draws, with time to line up and break the bridge.
j) It is difficult to fathom this end-play by Duke's computer. Simply crowning the king, either here, or at the next few moves, leaves White nothing.
k) An incredible move – the worst of the two games. Even I would never make a move like this! (WBG)
l) Black finally crowns his first king, some 8 moves late. (WBG)
m) 10-15, 5-1, 7-11, 1-5, 8-12 clears the ending. The end-play in this second game between the two computers was terrible. I should say that there are at present several thousand average Class B players who could beat either computer without difficulty.

ACM's 9th chess championships

. . . David Levy will serve as tournament director of the 9th annual North American Computer Chess Championship, being held in Washington, DC Dec. 3rd to 5th. Tournament organizing committee consists of Carl Diesen of the US Geological Survey and the Washington Chapter of ACM; Monroe Newborn of McGill University and Ben Mittman of Northwestern. Deadline for entries is October 20, 1978 and in-

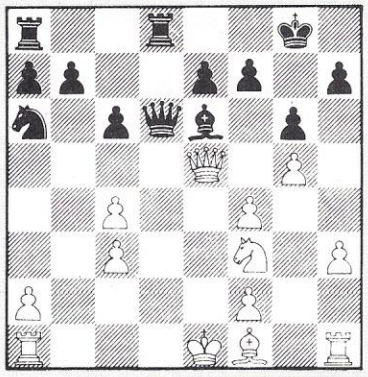
dividuals interested in participating should write to Prof. M.M. Newborn, School of Computer Science, McGill University, Montreal, Quebec H3A 2K6, Canada. The four-round Swiss style tournament is restricted to participants with computers. The affair will take place at the Sheraton Park Hotel in Washington, DC. Two rounds are scheduled for Sunday December 3rd, one round on Monday evening and the final round Tuesday evening.

Boylston C.C. checks on Toronto

. . . The Boylston Chess Club, in Boston, is one of the oldest clubs in the country. Walls of this old, high-ceiling room are lined with fading memorabilia of the past; cups won; pictures of famous ex-members; antique chess artifacts; members roster, past and present; bronze plaques; etc.

Recently, at a visit to that venerable place, we showed them the Toronto game in which BS'66'76 from the Netherlands tangled with Elsa from West Germany. As they played the game through, some of the members offered comments at various points as recorded below.

White: **BS'66'76** Black: **Elsa**



In this diagram White has just completed his 16th move. It is obvious that Black has a superior defensive position, his front lines intact, his major pieces out front ready to attack. White, on the other hand, has had his troops scattered all over the battlefield and there is not much time left to regroup.

1.	P-Q4	N-KB3
2.	P-QB4	P-KN3
3.	N-KB3	B-KN2
4.	N-QB3	0-0
5.	B-KB4 (a)	N-KR4
6.	P-K3 (b)	NxB
7.	PxN	P-QB4
8.	PxP	BxN
9.	PxB (c)	Q-B2
10.	Q-Q4	N-R3 (d)
11.	P-QB6 (e)	QPxP
12.	P-KR3	R-Q1
13.	Q-K3 (f)	Q-Q3
14.	Q-K5 (g)	B-KB4
15.	P-N4	B-K3
16.	P-N5 (h)	(see fig) N-B4
17.	R-QN1	Q-Q6 (i)
18.	BxQ (j)	NxBch
19.	K-K2 (k)	NxQ
20.	NxN (l)	P-KB3
21.	NxKNP	BxQBP
22.	K-K3 (m)	PxN
23.	PxP (n)	PxP
24.	RxP (o)	R-Q6ch
25.	K-K2	R-K1ch
26.	R-K7	RxRch
27.	K-B1	R-N6 mate

Annotation by Boylston's members

(a) "White's second mistake. The contrast between White, which does not understand pawn structure and Black, which does, is striking."

(b) "Justifies last move. Better would be 6. B-Q2." "A most obvious move with no consideration of result. Q-Q2 would suffice." "B-N3 is obviously a much better move. BS '66 '76 which is known to have been out of competition for 10 years from 1966 to 1976 – hence its name – is a little cautious. It evidently wants to look around a little before it gets into the fight. 'Lack of confidence has ruined many a good soldier,' Gen. George Patton once remarked."

(c) "Doubled and tripled pawns? White is playing out of his class."

(d) "This is the second time Black puts his Knight on a Rook file. However, the result seems to exonerate this play."

(e) "Since Black is better developed, the opening of the Queen file favors his play." "B-Q3 and P-KB5 would still offer some possibilities." "Why open the Queen file with loss of tempo? High time to think about the King with 11. B-K3."

(f) "Q-K5 is the preferred move." "Waste-of-time move. White never develops his idea."

(g) "I would play B-K2. Better chance." "Ridiculous!"

(h) "B-K2 seems better." "Ridiculous!"

(i) "P-B5 would have helped to break up the pawn formation in front of the Black King." "A pathetic move!" "Pointless advance. White simply weakens his position." "P-KB5 still offers some attacking advances. Now the Bishop could go back to QB3 after Knight moves from that position."

(j) "If Rook was now at QB1, then 18. B-K2."

(k) "K-B1 offers a better chance. Not terrific, but better."

(l) "White is just trying to postpone his material losses, poor fellow."

(m) "K-K1 is a much wiser play. It withdraws the King into a more defensible position."

(n) "Another mistake. But the fellow is lost anyway." "Why open the mating file?"

(o) "KR-Q1 is the best he can do. However, someone should teach the poor machine to resign." "Instead of knocking off non-threatening pawns, White should be concerned about bolstering his crumbling defense."

CONCLUSION: "The Black program played quite logically. White's evaluation functions seems faulty in several respects. Most glaring is its contempt for Pawn structure and its disgust for King safety. The last few moves of the game shows that Black can look ahead and play combinations. White cannot. In general, White performs like a computer program that is 12 years old – as its name indicates."

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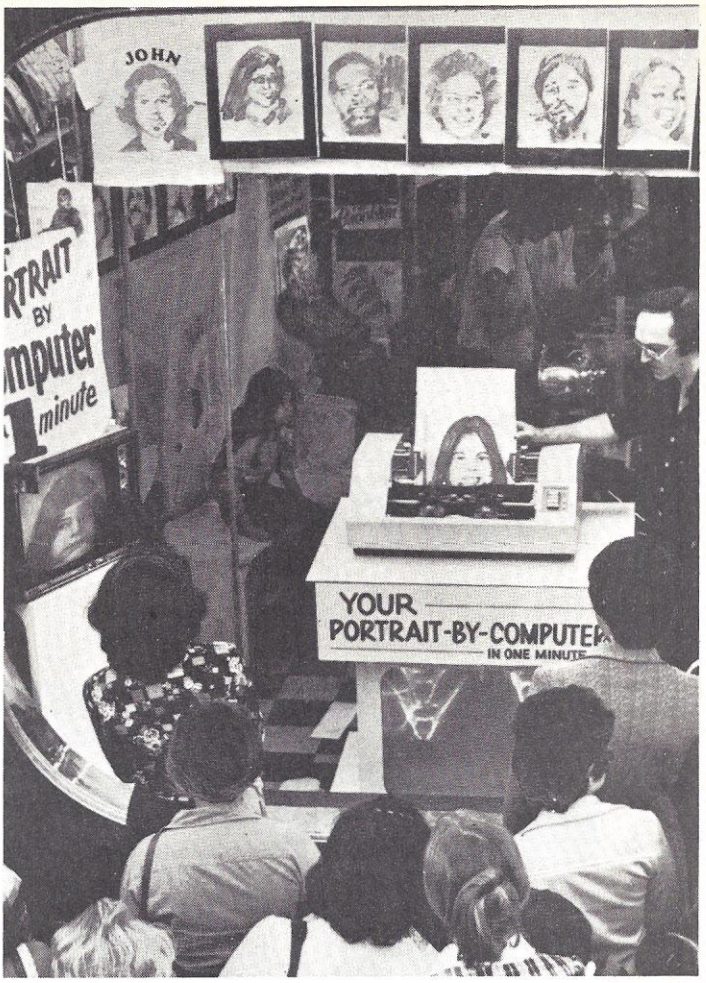

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T-SHIRTS	2@7.00 = 14.00	5@7.00 = 35.00	15@7.00 = 105.00	25@7.00 = 175.00
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GROSS SALES	2,370.00	4,950.00	10,650.00	16,500.00
COST OF GOODS SOLD	342.00	733.50	1,612.50	2,542.50
MONTHLY GROSS PROFIT	$2,028.00	$4,216.50	$9,037.50	$13,957.50
EXPENSES				
WAGES(@3.00 per hour)	720.00	720.00	1,000.00	1,440.00
RENT	1,000.00	1,000.00	1,000.00	1,500.00
ELECTRICITY	35.00	65.00	85.00	105.00
INSURANCE	23.00	23.00	23.00	23.00
MAINTENANCE CONTRACT	50.00	50.00	50.00	50.00
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CIRCLE 20

GRI KEYBOARD

AN IDEAL BEGINNER'S KIT

BY WILLIAM L. COLSHER

Have you hesitated to buy a computer because the one you wanted comes only as a kit or because you can't afford an assembled one? Are you worried that you won't be able to assemble a working computer out of all those parts?

Well, worry no longer. There's an inexpensive way to find out if kit building is for you. Try assembling the GRI Model 753 Keyboard. All you need is a soldering iron of low wattage, some resin core solder and pliers.

The hardest part of building this kit is opening the package without spilling parts all over the place or destroying the assembly instructions on the back of the package.

After you open the package, lay out the parts on a table and compare them to the parts list on the back of the package. There may seem to be about a million little pieces, but in reality most of them are key switches and key tops for the keyboard which push into place easily. Only eight discrete parts (four capacitors and four resistors) plus the encoder IC and its socket have to be installed.

Do not remove the black foam backing from the encoder IC until you're ready to install it; the foam helps protect the sensitive circuits from damage by static electricity.

A small trick to help mount the key switches is putting them in one row at a time and soldering only one pin of each switch. After installing the entire row, examine it carefully to make sure

all switches are perfectly flat and level. If you discover one that isn't, heat up the single solder joint and carefully press it into place. (Careful assembly at this point produces a keyboard that looks nice and is a pleasure to use.)

When you're sure all the switches are neatly installed, solder the second pin of each and proceed in a similar manner with the next row.

When you've got all the switches mounted, mount the discrete components and the IC socket. You may be confused about exactly where the resistors and capacitors go, but careful examination of the diagram on the back of the package should clear up any doubts. The IC socket should be installed with the pin one indicator adjacent to the arrowhead, which is immediately beneath the fourth gold colored connector finger from the left.

Now that you've installed all the parts that need soldering, you must install the keytops. Assembly is easy; the keytops simply push onto the plungers atop the switches. When everything is in place, set up a connector and apply power for testing. Detailed instructions are supplied for this procedure; the only testing required is checking voltages at the connector fingers. If everything is OK, turn off the power and install the encoder IC.

If you've never used a MOS device like this encoder before, heed these warnings. Because of the way they're made (using something called field effect transistors), metal oxide semiconductor (MOS) circuits are sensitive to stray electric charges, like static electricity generated by walking on nylon carpets or wearing nylon clothing. Even a small charge (on the order of 100 volts) can destroy these MOS devices. The amount of electricity in a familiar static shock is several thousand volts, so you can see how easy it is to completely zap these sensitive circuits.

By following a few simple rules, though, you can reduce this danger. First, as already mentioned, keep the device in its protective foam until you're ready to install it. Second, before picking up the device (or any circuit card with MOS devices), be sure to touch the surface it was on. This technique equalizes the electric potential between your body and the device. The same rule also applies when you put the circuit board down again. These rules won't totally insure you'll never zap a MOS device, but they'll help.

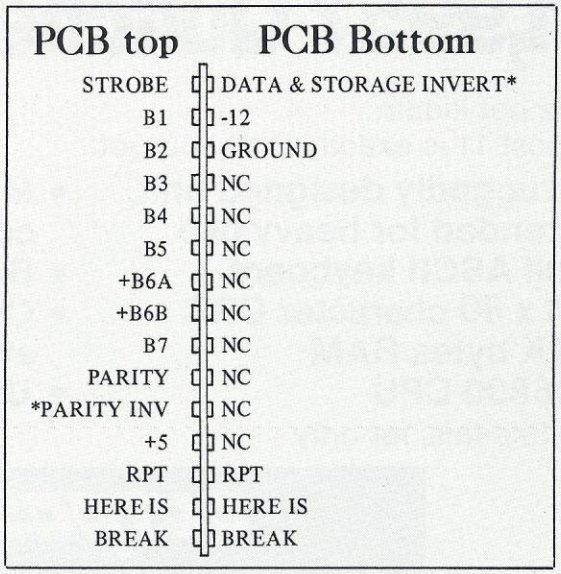
You'll need a parallel input port to use this keyboard, but the connections are simple. You'll need to make a jumper connection on the connector (at the keyboard end) to set up either positive or negative logic and you'll have to chose whether you want all capitals or lower as well as upper case capabilities.

Then, connect the other eight lines (seven data bits and a strobe) to the appropriate pins on your parallel I/O board and you're ready to go.

I think you'll be rather pleased with this keyboard. Although the touch isn't quite the same as a Selectric, a little practice reveals typing with it can be rather pleasant.

One optional part you should consider buying is the molded plastic case. Though not the world's prettiest, it's a lot better than nothing. The case costs about the same as a replacement encoder chip and does provide some protection for that chip. □

FIGURE 1 BUS LINE



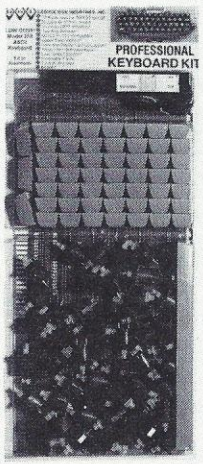
+ Note – B6A provides upper and lower case, B6B provides lower case only

* Note

Jumper To	Data and Strobe Outputs	Parity Output
+5	Negative Logic	even
GND	Positive Logic	odd

TABLE 1 – PARTS LIST

1	PC Board
1	Encoder IC
2	.05 μf Disk Ceramic Capacitors
1	56 pf Disk Ceramic Capacitor
1	.0033 μf Disk Ceramic Capacitor
1	40-pin IC Socket
2	4.7K ¼ Watt Resistors
1	100K ¼ Watt Resistor
1	608K ¼ Watt Resistor
1	Space Bar Support
1	Space Bar Rod
2	Space Bar Inserts (Right and Left)
2	#2 x 1/2" screws
2	#2 Hex Nuts
52	Key Caps
1	Space Bar
53	KBM-01-01 Keyswitches



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CIRCLE 56

Someday Your Prints Will Come

P.T. Barnum's cast of characters included a giant, Tom Thumb, and exhibits representing nearly every country in the world.

An equally wide ranging set of characters is offered by Media 12/7, a typographic printer that generates characters from footnote size to the largest headline size in any language character set, including ideographic languages such as Japanese and Chinese.

Besides producing graphic images such as company logotypes, line drawings and solid area designs, Media 12/7 creates cursive fonts in anyone's handwriting, prompting a company spokesman to remark, "Electronic mail takes on the ultimate dimension as a result of Media 12/7's ability to print the sender's signature and letterhead with the text at the point of receipt."

The printer's electronic memory can store 12 to 20 typefaces, according to the customer's needs. With Media 12/7, a single printer can replace multiple printers in multi-speed, multi-quality or multi-language applications.

Offered by Sanders Technology, Media 12/7 reduces manual operator functions and adjustments to a minimum. To print a page, the operator inserts a sheet of paper. The printer automatically locates the paper's edge and feeds the sheet to the first print line. The push button control panel shows the status of the paper or ribbon supplies, successful completion of the self test and operational status of printer. Push button controls allow the operator to reset the printer, perform test functions, produce draft quality output and move the paper forward or reverse.

Users can vary print speed, typefaces, line spacing, formats and type justification within a line or throughout an entire page of output without making mechanical adjustments or interrupting printing operations. Media 12/7 is expected to have a full library of type styles.

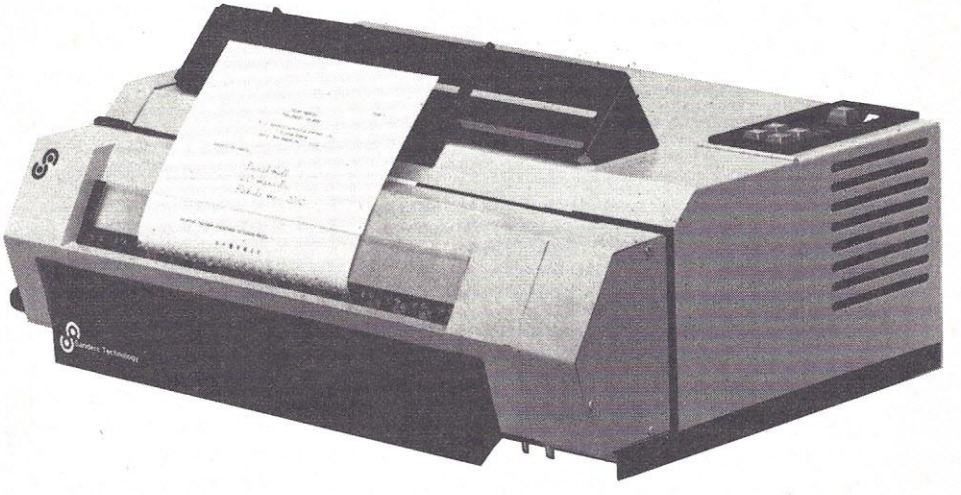
Media 12/7 embodies a minimum of moving parts and an advanced microprocessor controller. This combination of design elements provides system flexibility, operating reliability and serviceability in a compact unit at a low unit manufacturing cost. The microprocessor requires special software for accurate registration for typeface storage.

Sanders claimed that Media 12/7's text quality equals or surpasses that of IBM's Selectric Typewritter. Media 12/7 has characteristics only available on advanced laser and ink jet printing systems, he added.

Media 12/7's flexibility and versatility derive from the infinite matrix principle, an imaging method that positions ink dot placement horizontally to a 0.001″ resolution and vertically to 0.0035″.

A series of horizontal passes of the 7-pin impact print head, interlaced with vertical paper motion, positions the dots on the paper. On a one-pass operation, the printer can produce up to 216 cps with characters "more accurately formed and easier to read" than standard matrix printers, according to the company. On a two-pass printing function, the head impacts each character on the line going left to right, then right to left, maintaining a 116 cps speed while printing in 7 1/2 point type. Raising the number of passes to four improves quality while decreasing the speed to that of typical wire matrix printers (35-50 cps). On a four-pass operation, the print quality is suited for typographic reproduction and executive business applications, said the company.

Graphic images such as signatures, letterheads, logos and sketches may be digitized, electronically stored and printed with high quality by the Media 12/7. Up to 56K bytes of storage are available for typefaces, graphic images, or forms storage. The average high quality 4-pass typeface uses less than 4K bytes. The high speed one-pass typefaces utilize less than 2K bytes, and a signature or logo may use less



Sanders Technology introduces the MEDIA 12/7 typographic printer which provides high quality (graphic or character) output from a wire matrix printer. The printer generates characters from footnote size to the largest headline sizes in any language set, including ideographic langauges such as Japanese or Chinese with equal ease. Up to 20 typefaces or signatures can be stored internally in the machine and changed under software control.

than 2K bytes. Thus an average user might have 3 to 6 high quality typefaces and 3 or 4 high speed draft faces and still leave room for storage of 6 or more signatures or forms inside the Media 12/7. Extra (optional) cards provide for additional typeface storage inside the Media 12/7 or provide a floppy disk interface for unlimited typeface, signature, or forms storage. Both serial and parallel interfaces (Qume Sprint Micro 5 compatible) are available as standard features.

Options available for the Media 12/7 include roll paper feed and a paper scoop for immediate viewing of print output. Options available in the coming year include automatic sheet feed and tractor feed. In addition, new interfaces will provide for image, facsimile, and plotter modes.

Either as part of a system or as a standalone point-of-need printer, Media 12/7 will provide hard copy output for word processing systems, graphic arts composition systems, small computer systems and remote computer terminals in the areas of data processing and telecommunications.

John Hoffman, marketing manager for Sanders Technology, said, "OEM prices can be as low as $1350. The end user price is expected to be in the $3000 to $4000 range." Hoffman expects full OEM deliveries to begin soon.

Hoffman said, "The marketing thrust is aimed at Original Equipment Manufacturers and companies who want 'captive' licensing rights to manufacture the printer for their own product line in the U.S. or abroad."

A Sanders Technology spokesman said, "The ability to print high quality output, graphics, signatures, and characters at the individual work station is a major step toward the office of the future. With the introduction of the new Media 12/7 typographic printer, this capability is available at the price of daisy wheel printers. At the same time high speed draft copy superior to the conventional matrix printers is available whenever desired.

"There is virtually no limit to the shape or size of the characters or images that can be produced on the Media 12/7," he added.

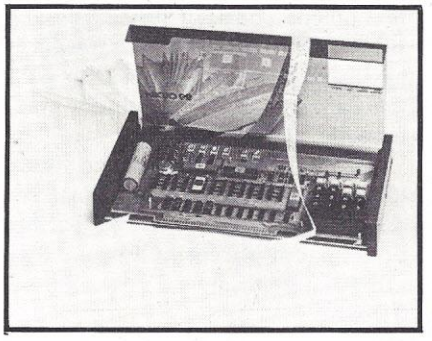
Contact R.C. Sanders Technology Systems Inc., 5 Tinkham Avenue, PO Box 324, Derry, NH 03038; (603) 434-1571. *Circle No. 100*

IMSAI VDP-4X Computer

Designed for both office and home use, the Imsai Series VDP-4X is a complete assembled and tested microcomputer system suited for small businessmen and systems developers.

Three versions, the VDP-40, VDP-42 and VDP-44, provide disk storage capacity of 180K, 400K and 780K bytes.

A fully integrated system, the VDP-4X features an 8085 microprocessor, 32K/64K RAM, dual 5-1/4-inch floppy disk drives, 9-inch CRT, keyboard and serial I/O, all in a desk-top cabinet. IM-



DOS, the Imsai Multi-Disk Operating System supplied with the VDP-4X, offers utilities including video/context editor, 8080/85 assembler, dynamic software debugging program and floppy disk system diagnostic program.

The VDP-4X communicates with other Imsai VDP-4Xs and other 8080/85-based computers, or acts as a terminal in a data communication network. Possible applications include distributed data processing, and accounting and inventory functions.

The Multifunction Processor Board (MPU-B) contains an 8085 microprocessor and a serial I/O interface. The 8085 microprocessor maintains or improves bus timing margins, thereby reducing critical timing requirements of RAM and other interfaces.

The Video Interface Board (VIO-D) contains logic and firmware necessary to create and control the CRT screen display. Firmware-controlled display options include a 24-line by 80-character display format, insert/delete, programmable character set (font), protected fields and inverse video. The VIO-D supports a 256 alphanumeric and graphic character font, both upper and lower case ASCII characters (with descenders), special symbols and a line-drawing character set. With user-provided EPROMs, the font may be customized to create special characters of the user's design, including foreign alphabets, pictures and forms. The standard typefont generated by the VIO-D is a 5 x 7 dot matrix in a 7 x 10 dot cell.

The 9-inch CRT with a 14 MHz bandwidth minimizes operator fatigue by offering a large viewing area and a non-glare faceplate.

Six motherboard slots are available for user expansion with the VDP-40, while five slots are available with the VDP-42 and VDP-44.

The programmable keyboard console utilizes an 8035 control processor and a high quality keyboard array, fully debounced (to ensure that a character is printed only once each time a key is engaged). Keys are arranged in typewriter layout for operator convenience. In addition, each key stroke is registered regardless of the number of keys pressed simultaneously (N-Key Rollover).

The power supply is a heavy-duty, regulated and unregulated unit. It outputs an unregulated +16 volts DC at 4.5 amps, +8 volts DC at 16 amps and -16 volts DC at 3 amps. Three lines provide +12 volts DC, one at 1 amp and two at 2 amps; and two lines provide +5 volts DC at 1 amp. The power supply requires 95-130 volts AC at 60 Hz in the domestic version. An international version requires 95-130 volts AC or 190 to 260 volts AC at 50-60 Hz.

Included with the VDP-4X, IMDOS (Imsai's Multi-Disk Operating System) includes high performance utilities, such as enhanced 8080/85 assembler, video/context editor for program development and documentation, dynamic software debugging program and comprehensive system diagnostic program.

Software available for the VDP-4X includes ANSI Level 2 FORTRAN IV, a linking loader and four kinds of BASIC – Microsoft, Commercial, 8K and Extended.

A built-in serial port drives optional peripheral devices, including line printers, modems and auxiliary terminals. Expansion capability allows the user to increase RAM, I/O and disk drives.

For more information, contact Imsai Manufacturing Corporation, 14860 Wicks Blvd., San Leandro, CA 94577; (415) 483-2093. *Circle No. 101*

Systems

NCR Corporation has announced a new low-cost **electronic teller terminal** for financial institutions which can handle most transactions at teller windows, including the printing of passbooks, ledger cards and other inserted documents.

The microprocessor-based NCR 2251 complements the current line of NCR terminal systems for financial institutions and can operate as a free-standing system or can be upgraded for on-line communications and data-capture capabilities at a later date.

Programs, which tailor the terminal's functions to the specific requirements of the financial institution, can be entered using the terminal keyboard. If the terminal is on-line, the programs can be loaded through a central processor or cassette unit.

In addition to standard teller-transaction functions normally provided by free-standing terminals, the new 2251 offers other capabilities including the calculation of interest as a by-product of normal transaction processing. Also, the new terminal can be used for both front-office and back-office transactions. In addition it can perform positive proof of deposit at the teller station and automatically produce withdrawal checks.

The inserted-forms station used for passbooks and printing on various inserted documents includes a 90-column matrix printer. The formats used are programmed to satisfy each financial institution's specific needs.

The new terminal is priced at $6950. It will be available for customer delivery next month. For more information, contact NCR Corporation, Dayton, OH 45479; (513) 449-2150. *Circle No. 149.*

NCR Corporation today introduced a **modular terminal for its checkout systems** in the food and mass merchandising industries.

Supplementing the NCR 255 terminal, the NCR 2552 terminal uses the same in-store computer and software programs as the NCR 255 and the two can be intermixed in the same store. The new NCR 2552 comprises separate components, including electronics module, power supply, keyboard/display, cash drawer, customer display and up to three printers. The various modules can be grouped together as a unified low-profile terminal or placed at separate locations at the checkstand.

The terminal can be provided with receipt, journal, and slip printers, which are compact and use dot matrix characters.

In addition to providing flexibility in configuring the checkstand, the system allows the store to select only the components required for other locations. For example, a terminal in the manager's office might require only the keyboard/display, a printer, power supply and electronics module.

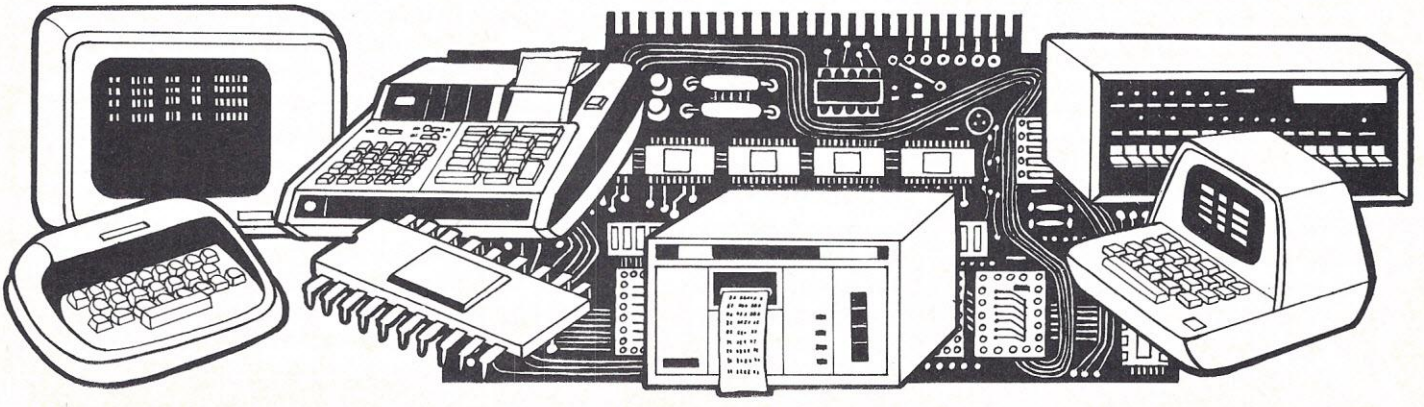
Prices for the NCR 2552 terminal, including keyboard-display, electronics module, cash drawer and three printers begin at $3,445. For more information, contact NCR Corporation, Dayton, OH 45479; (513) 449-2150. *Circle No. 130.*

Electronic Product Associates, Inc., San Diego, CA, announces a complete **ready-to-use microprocessor** offering an economical solution for both scientific applications and industrial usage. The MICRO-68 computer system is priced at $495 completely assembled. Built around the Motorola/AMI/Hitachi 6800 microprocessor, the MICRO-68 comes with its own integral power supply, 16 button keyboard, a six digit LED display and 128 words of RAM. The 512 MON-1 Bug PROM contains all the service necessary to load programs easily, inspect and edit them as necessary, insert break points for debugging and execute. Memory expansion to 64K and full 16 bit I/O can be obtained by convenient edge connectors which are provided for. All of the mem-

ory lines of the MICRO-68 can be buffered on board. The MICRO-68 comes in a hardwood cabinet with a transparent smoked plexiglass lid and measures 9" x 16" x 2". Delivery is from stock.

For more information, contact Electronic Product Associates, Inc., 1157 Vega Street, San Diego, CA 92110; (714) 276-8911. *Circle No. 102.*

Fairchild Camera and Instrument Corporation has introduced the SPARK-



16 **single-board, 16-bit microcomputer** based on Fairchild's 9440 Microflame CPU.

SPARK-16, developed for exercise and evaluation of the 9440 Microflame, can also be used as a stand-alone microcomputer for applications that require small amounts of memory. More complex systems can be built using the SPARK-16 plus additional boards to be available later.

The 9440 is Fairchild's recently announced 16-bit microprocessor which operates at a clock rate of 10MHz and executes the Data General Nova 1200 instruction set.

SPARK-16 is built on an 8 x 10-inch board with the standard S100 connector. It includes the 9440 16-bit CPU, 8192 bytes of RAM, 4096 bytes of PROM and memory control with DMA (direct memory access).

The single-board microcomputer also features an asynchronous port for current loop (TTY) or RS232C interface, a 100-pin edge connector with the 9440 bus, a connector for TTY/RS232C and control switches for Autoload, Continue, Halt and Reset.

The board comes fully assembled and tested with FIREBUG resident as firmware in the PROMs. FIREBUG is Fairchild's interactive entry and debugging program which acts as a position-independent miniexecutive for SPARK-16. Fairchild also offers Baby Basic in PROMs as an option.

SPARK-16 requires only a single 5V, 3A power supply and a terminal to be operational. When the Reset and Autoload switches are activated, FIREBUG (running out of PROMs) provides a system ready to accept commands interactively from the terminal.

SPARK-16 boards are available immediately either from Fairchild local sales representatives or franchised distributors. Single unit pricing is $995. For more information, contact Fairchild Camera and Instrument Corporation, Semiconductor Components, 464 Ellis Street, Mountain View, CA 94042; (415) 962-3816. *Circle No. 170.*

Bulletin 90, 8 pages, letterhead size and printed in full color, explains the new "IPC 90" microprocessor-based **programmable controller for small to medium industrial applications.**

The central processor unit includes logic, control, memory and power for the entire system. The mounting bases, up to six, hold the input/output and logic interface modules. The central processor unit requires only 10 by 16 inches of panel area; each mounting base 9 by 15 inches. The central processor has 100% solid-state read/write (RAM) memory and read only (PROM) memory, field-expandable from 256 to 1048 words.

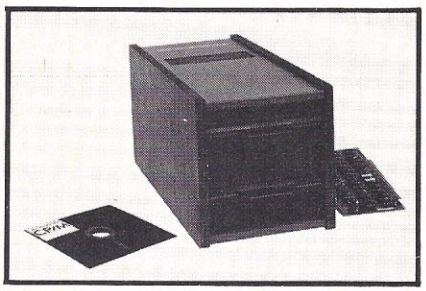
A hand-held read/write memory loader provides complete programming, editing and real-time monitoring. This is as easy to use as an electronic calculator. Programs can be created, tested and debugged before they're entered by means of a desk-top simulator. Trial-and-error programming is thus entirely eliminated.

Industrial Solid State Controls, Inc., 435 W. Philadelphia St., P.O. Box 934, York, PA 17405; (717) 848-1151. *Circle No. 120.*

Continued on p. 128

Peripherals

A new family of **expandable floppy disk systems**, called EXP, from Micromation, Inc., in San Francisco, CA offers some exclusive benefits and features in full-sized (8" diskette) floppy systems with dual and single drives for under $2000.



EXP is a complete floppy system using standard 8" diskettes, with no high-priced options and a write-protect and front panel activity light as standard. Micromation mangement claims delivery of either a dual-drive or single-drive version of EXP – fully assembled, tested and ready to operate – in four weeks or less from ordering date.

According to Micromation, EXP can expand with a customer's needs. Micromation has an exclusive arrangement with Memorex, manufacturer of EXP drives, to provide fast and easy conversion for only $300 per drive to double-headed drives that can record on both sides of a standard 8" diskette.

Micromation also offers an optional double-density controller (for $300) that permits doubling the actual density of data on each diskette. Conceivably, with an EXP Series floppy disk system, a user could increase the storage capacity of his original dual-drive floppy system to over two megabytes with a minimal cost investment for conversion.

The highly reliable EXP floppy system uses drives supplied by Memorex, the oldest independent supplier of floppy drives. Each drive offers full 265K byte storage in IBM 3740 soft-sectored format. Drives are fully warranted for six months (with an optional one-year warranty extension available for a nominal fee).

EXP is fully supported by strong software. For program development, a user is offered CP/M as one option. CP/M, as the most powerful floppy disk operating system available for microcomputers, has become the standart of the industry. Micromation also offers a choice between such high level languages as BASIC and FORTRAN, or complete business application and word processing packages.

EXP Series floppy systems also can work with such microcomputers as SOL (that don't use CP/M) by employing optional I/O drivers.

EXP is a complete, fully assembled and tested floppy disk storage system that's ready for operation immediately. Total system includes: drives, S-100 controller, power supply and handsome Scandinavian style wood and metal enclosure. EXP-1 single drive system is priced at $1195, and the EXP-2 dual-drive system is $1895. For more information, contact Micromation, Inc., 524 Union Street, San Francisco, CA 94133; (415) 398-0289. *Circle No. 150.*

A **floppy disk subsystem** tailored to the Intel 8010/8020 bus architecture has been developed by Micropolis Corporation in multiple configurations delivering up to 3 million bytes of formatted data storage.

The SBC-55 is a complete plug-compatible subsystem consisting of

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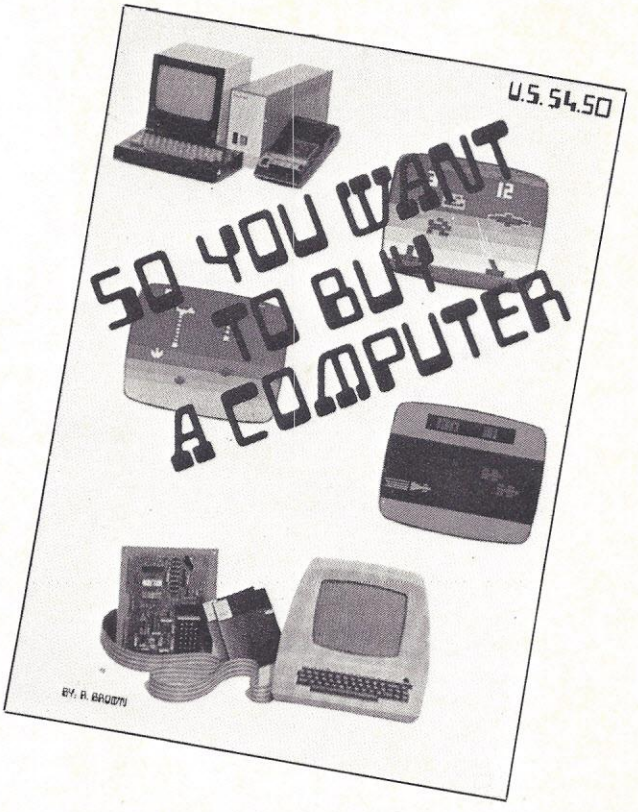

This new book presents an objective look at the top 24 micro systems sold throughout the world. It discusses the Pros and Cons of each system in No Uncertain Terms and takes a straight-forward look at the micro computer industry as it relates to YOU. Written especially for the layman in a language he can understand. Profit from the mistakes of others.

Includes hundreds of references.

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dual-drive storage module, integral power supply, controller board, a Multibus interface adaptor board, interconnecting cables, program development software supplied on two 5-1/4-inch diskettes and a subsystem user manual.

A configuration containing a Model 1055 storage module has a 1.5 MByte capacity, according to Robert D. Chisum, Micropolis marketing manager. The subsystem may be expanded by a Model 1035 dual-drive add-on module, which provides up to 1.5 million bytes of additional storage.

The primary market, Chisum said, is for software development systems which currently require higher storage capacities than are available on conventional 5-1/4-inch drives. With a recording density approaching 400,000 bytes per surface, the SBC-55 offers development system users 8-inch drive capacities at 5-1/4-inch drive prices.

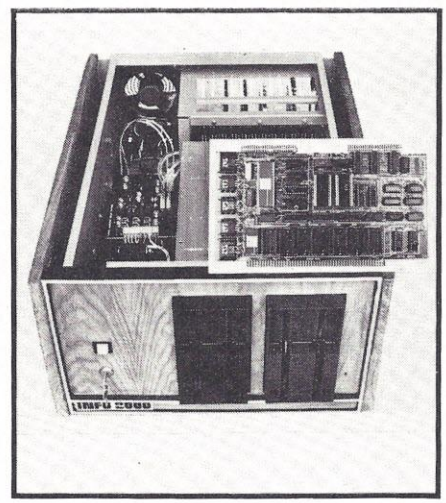
The SBC-55 unit price is $2300 for the single-sided, dual-drive version and $2700 for the double-sided, dual-drive model. The prices include, in addition to the above components, a microprocessor-based controller that performs data formatting, encoding and decoding, sector buffering, error detection and recovery, and other duties.

The new product is the only end-user 5-1/4-inch floppy on the market today to offer double density recording combined with 77 data tracks per surface to achieve "quad" density.

For more information on this product, contact Micropolis Corporation, 7959 Deering Ave., Canoga Park, CA 91304; (213) 703-1121.
Circle No. 147.

INFO 2000 Corporation has announced immediate availability of their **floppy disk system for S-100 bus microcomputers.** The disk system incorporates a controller board called DISCOMEM, originally developed for use in the INFO 2000 Business System. This controller enables the manufacturer to offer much faster disk performance while lowering the overall cost of the disk system by $400. The S-100 disk system combines the PerSci Model 277 dual diskette drives with the INFO 2000 DISCOMEM Controller Board and Digital Research CP/M to provide all necessary hardware and software, when added to any S-100 bus computer, for immediate operation. Two spindles accept standard soft-sectored 8" flexible diskettes. The system provides full compatibility with IBM 3740 format.

The PerSci drives used in the INFO 2000 Disk System have voice-coil positioning. They provide seek times up to eight times faster than other drives using stepping motors for positioning. A



full disk-to-disk copy with read-after-write verification takes well under a minute, formatting and verifying a new diskette takes less than half a minute, and reloading the CP/M Disk Operating System from disk takes only a fraction of a second.

In addition to the disk controller, the DISCOMEM board contains I/O interfaces required for most microcomputer systems. These include 2 RS-232 serial interfaces with software selected baud rates from 50 to 19,200 bits per second, 3 8-bit TTL-level parallel interfaces (2 output, 1 input), and provision for 8K of EPROM or for 7K of EPROM and 1K of scratchpad RAM. The I/O facilities enable the DISCOMEM to be combined with just two additional S-100 logic boards – a CPU board and a 32K RAM board – to create a complete high-performance, disk-based microcomputer system for business or scientific applications.

Cost of the complete dual-drive disk system, including all I/O facilities and CP/M is $2600. Another model, without the I/O facilities, is available for $2450. Delivery of the system, fully assembled and tested, is quoted by the manufacturer as two weeks from receipt of order. For more information contact INFO 2000 Corporation, 20630 S. Leapwood Ave., Carson, CA 90746; (213) 532-1702.
Circle No. 146.

Industrial Electronic Engineers, Inc. (IEE), a supplier of diversified information display technologies, presents its largest ARGUS **panel display system.** The new, page size display provides 320 (8 rows of 40) characters and is one of a series of several new displays with 40 characters per line.

All units provide .21" characters in the familiar 5x7 dot matrix, although this family of models actually contains 5x9 capability for future lower case or European font uses. The larger versions display 12 and 24 lines of data, while a compact 2-line unit is also in development. All models are available in neon-orange (filterable to red) or green display. A standard editing cursor is featured along with high (100KHz) data loading rates, low power, extremely wide (120°) viewing angles and the steady pleasing display associated with DC neon gas discharge units.

Manufacturers of terminals, automatic teller machines, word-processing equipment and specialized test and control devices will benefit from the application of this new system. It requires less than 25 watts, offers 50,000 hour life, is only 2.75" deep and operates with a standard TTL ASCII interface.

The complete system, including all electronics, is priced at $699 at the 100-piece level. Delivery is off-the-shelf. For more information, contact Bob Groshong, IEE, 7740 Lemona Avenue, Van Nuys, CA 91405; (213) 787-0311, X275. *Circle No. 145.*

A low-cost **video display terminal** with up to eight pages of memory, 16 function keys and total flexibility of format, editing, interface and transmission has been released for sale by Lear Siegler, Inc./Data Products Div.

Priced at $1795 in single quantity, the new ADM-42 comes standard with two 1920 character pages of memory that can be optionally expanded in two page increments to eight full pages. All pages have independent protect, write/protect, program mode and cursor retention characteristics that are automatically retained in the terminal's memory for recall when the user pages to another screen of data.

The ADM-42 features a detachable keyboard with upper and lower case, numerics, punctuation, control, num-

eric keypad and 16 function keys as standard. The function keys are shiftable to initiate 32 specific functions external to the terminal. Programmable function keys are also available as an option.

In addition to complete cursor positioning from the keyboard or host computer, the operator may designate fields in blanking/underlining, blinking or reverse video modes to highlight key data. A field protection mode also allows the user to protect specific areas on the screen. These fields appear in reduced intensity and cannot be typed over, or overwritten by the remote computer until the terminal is removed from the protect mode.

The ADM-42 also gives the operator three ways to tab: a protect mode that tabs to the first unprotected space; a modulo tab set at any number from 1 to 79; and a columnar tab equivalent to that on a standard typewriter.

Other standard editing capabilities include: clear space, character/line insert, character/line delete, line erase, page erase, tab/back tab.

The terminal features a high resolution, 15 inch diagonal display screen with 1920 characters arranged in 24 rows of 80 characters and a 7x9 dot matrix. A 25th line is also provided exclusively for terminal status indicators and messages of up to 79 characters. With an optional monitor stand, the ADM-42's detachable keyboard and monitor can also be conveniently separated from the terminal's control unit for added space savings.

The ADM-42 is directly compatible with the company's ADM-2 and is preprogrammed at the factory for compatibility with many industry standard computer systems. Parameters such as alternate ESC sequence lead-in, end block character, new line character sequence, field separator and a function sequence preamble are easily changed from the "keyboard" or computer to conform with the user's specific computer system or systems.

Full or half duplex conversation modes are also switch and keyboard selectable. Standard block transmission modes are: Send line unprotected, send line all, send page unprotected, send page all, send message unprotected, send message all, send cursor coordinate and send function sequence.

RS-232C and 20 mA current loop interfaces are standard. Asynchronous baud rates include: 50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 3600, 7200 and 9600.

A synchronous communication interface, special character generator and line drawing set, and serial or parallel printer interfaces are also available as options.

For more information, contact Lear Siegler, Inc./Data Products Division, 714 N. Brookhurst, Anaheim, CA; toll free (800) 854-3805, in California (714) 774-1010. *Circle No. 144.*

A low-cost, 180 cps **matrix printer** has been introduced by Lear Siegler, Inc./Data Products Division.

Priced at $2045 in single quantity for the serial interface model and $1995 in single quantity for a parallel version, the 300 Series Ballistic Printer features a built-in microprocessor that provides complete control of all print functions, 15 switch selectable form lengths, 15 perforation skipover formats and complete vertical and horizontal tabulation control.

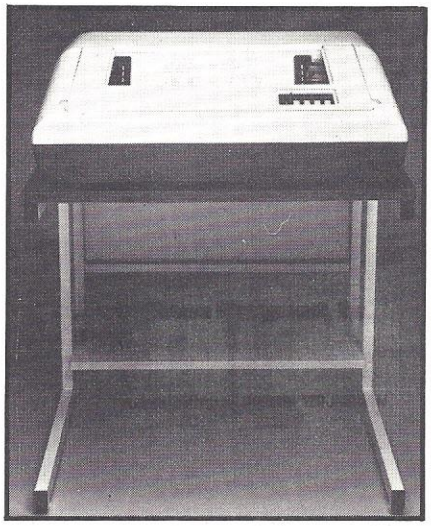
For application flexibility, especially in bilingual printout applications, the processor also gives the user print and font controls that enable the printer's 128 printables to be expanded to two sets of 128 for alternating character sets on a line-by-line basis.

Another benefit of the 300 Series microprocessor is a space and blank character compression buffer. As data is received, the buffer looks ahead and automatically compresses all space and blank character counts into one, two or three byte strings. This maximizes the printer's data buffer storage capacity for data-not-spaces and allows the printer to tab over blanks and spaces at slew rates of 50 inches per second for increased throughput.

The Model 310 (Serial Interface) comes standard with a 512 character buffer. The Model 301 (Parallel) has a 256 buffer. Both are optionally expandable to 2048 characters making it possible to fully buffer a 1920 character CRT screen of data without waiting for the screen to transfer to the printer on a line-by-line basis. Consequently, the operator can input a second page of data on a CRT while the printer prints the first page.

To retain the operator's programmed forms and print/font controls when power to the printer is turned off, the 300 Series also features a resident, nonvolatile format retention system. The battery powered system operates only when ac power is terminated and holds format settings for up to 96 hours at a time. Battery life expectancy is conservatively rated at two years.

The 300 Series includes a patented Ballistic Print Head designed to operate without duty cycle restrictions and with a print life greater than ordinary solenoid-type heads. The print head provides a 9 high x 7 wide dot matrix for true underlining and lower case descenders. It also enables printing on forms that range from 100 lb single part stock to multi-part forms consisting of up to one original and five copies.



For more information, contact Lear Siegler, Inc./Data Products Division, 714 N. Brookhurst, Anaheim, CA 92803; toll free (800) 854-3805, in California (714) 774-1010.
Circle 143.

A no frills low-cost CRT terminal with either 64x16 or 32x16 characters screen format has been added to the Informer product line.

An Informer spokesman said the new D-311 model, available with either a 6- or 9-inch screen, is basically the standard Informer terminal without factory-set options. The customer may, however, set parity, baud and some cursor codes. An options chart is included with each unit to facilitate changes.

The D-311 is priced individually at $850 per keyboard/display. Quantity prices are available on request.

The D-311 is factory-shipped with the following characteristics: option 15 keyboard, upper case only; 6-inch CRT; 9600 baud, preset, with 15 rates selectable; full/half duplex operation, switch selectable; automatic scrolling; 2 intensities, blinking fields; selective erase; RS232C interface; underscore cursor, cursor positioning (x,y); odd parity; bell; 110/220 volt operation; N-key rollover keyboard, and automatic line feed.

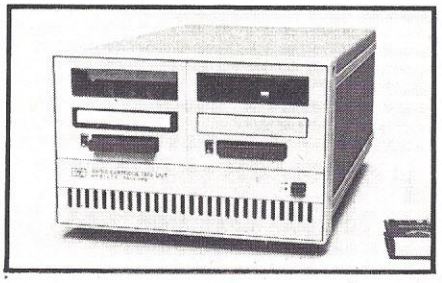
For more information, contact Will Little, Vice President, Informer, Inc., 8332 Osage Ave., Los Angeles, CA 90045; (213) 649-2030. *Circle No. 142.*

A tape cartridge mass memory unit that performs data logging from a data source without the need for a controller, provides additional storage for systems using a controller, and transports data between different HP desktop computers is now available from the Hewlett-Packard Company.

The HP 9875 Cartridge Tape Unit is available in either single or double tape drive configurations, each tape containing as many as 225K bytes of information. Both models share the capabilities of data interchange and acquisition. A built-in microprocessor offers an extensive 23 command set to provide maximum formatting flexibility.

Through the HP Interface Bus (IEEE Standard 488-1975) the HP 9875 may be interfaced to all Hewlett-Packard Series 9800 desktop computers (Models 9845, 9831, 9830, 9825, 9821, 9820). Data from any computer in the series can be stored and read into any other. Old data files can be used on new computers without manually re-entering the data. Because the tape unit stores data in HP's Standard Interchange Format (SIF), an SIF-compatible machine can read any HP 9875 tape on its own internal tape drive. Data can be transported between any two SIF-compatible can generate SIF-compatible tapes using the HP 9875.

A 'listen-only' mode enables the HP 9875 to perform certain data acquisition operations independent of an external controller. In the 'programmable listen-only' mode, the HP 9875



can read and execute a tape command.

Similar to a disc, the HP 9875 partitions its tapes into files and records, with two physical tape tracks treated as a single logical track. Data can be organized into either serial access or random access formats in record sizes from 2 to 256 bytes. The HP 9875 is also equipped with a programmable I/O delay and the capacity to respond to both serial and parallel polls.

The HP 9875 Cartridge Tape Unit is priced at $2600 with one tape drive and $3100 with two tape drives. Optional HP desktop computer interfacing is available. Delivery is six to eight weeks.

For more information contact Inquiries Manager, Hewlett-Packard Company, 1507 Page Mill Road, Palo Alto, CA 94304; (415) 856-1501. *Circle No. 141.*

Introduced by GNT Automatic, Inc. of Waltham, MA, the GNT 36 **Tape Punch** handles oiled and dry paper tape and all types of Mylar and Mylar foil tapes without adjustment. Easily integrated into a wide variety of equipment, the compact unit measures only 2.4"W x 4.7"D x 3"H. All components in the modular device are field replaceable by the user.

Providing a die block life of 150 million characters, the GNT 36 punches up to 50 characters per second. With an allowable back tension of about 5 oz., the bidirectional unit accommodates 5, 6, or 8 hole tape widths, selectable by the user. A second version of the GNT 36 punches up to 75 characters per second.

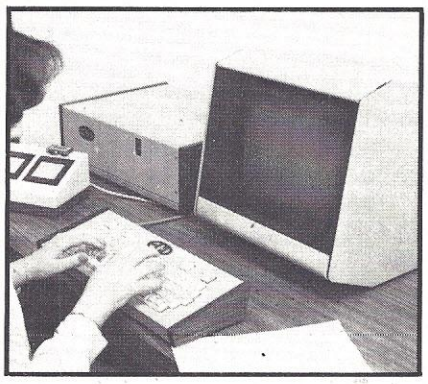
The GNT 36 Tape Punch is priced at $495 in single units; quantity discounts are offered.

For more information contact GNT Automatic, Inc., Verner Norby, Marketing, 440 Totten Pond Rd., Waltham, MA 02154; (617) 890-3305. *Circle No. 140.*

The ECD SMART ASCII, a **CRT based intelligent terminal**, can display full line-printer format: up to 132 characters per line. It can display up to 40 lines on its 15" CRT with up to 4096 characters. The standard font is the full upper and lower case ASCII character set, but by using the supplied font editor program users can design their own special characters. The keyboard is relegendable so users can easily modify it to match a new character set. Foreign language fonts can be implemented.

The interface for the SMART ASCII does not require any special protocol from the host. It communicates via an RS-232 line and looks like a simple printer/keyboard combination to the host. This allows for either direct hookup, or remote use via dial-up lines with keyboard selectable baud rates from 110 to 9600.

The SMART ASCII comes with a text editing program that allows com-



plete off line editing and supports transmitting data at a character, line, or block at a time to the host. The SMART ASCII will also execute user written BASIC programs.

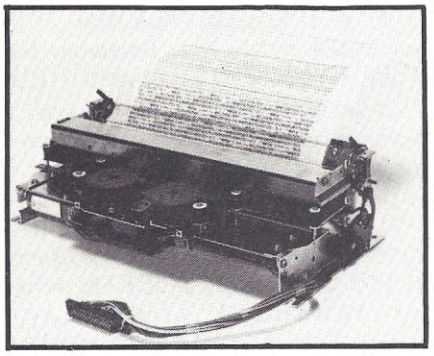
The system consists of a control unit with 37K of memory, a 78 key keyboard, a 15" CRT and 2 mini cassette drives at a price of $7900.

For further information contact Richard Eckhardt, ECD Corp., 196 Broadway, Cambridge, MA 02139; (617) 661-4400. *Circle No. 139.*

Epson America, Inc. introduces an 80-column Model 3110 Dot Matrix Printer Mechanism featuring a **one-hundred-million character dot head.**

This new mechanism offers OEM three times the present head life of mechanisms in its price range. It sells for less than $250 in 500 quantities.

Long life of the head with ruby-jeweled support comes from the mechanism's precise alignment and pin movement using techniques developed by Shinshu Seiki Co., Ltd., Epson's parent in Japan.



The Model 3110 prints 80 columns at 150 characters per second, with a 5x 7 dot matrix character and 1/10 column spacing tailored for the small-business and home computer markets.

DC power used for the magnet, solenoid and detector allows OEM to save manufacturing cost by purchasing the standard Epson mechanism for use with systems that will run on US or foreign line currents. The unit requires a 24V/30-42V/5V DC power supply provided by the OEM, plus appropriate case, control board and interface electronics.

Size of the Model 3110 is 95 mm high, 335 mm wide and 185 mm deep; weight is 6.6 pounds (3 kilograms).

A 40-column version of this mechanism is currently available, designated Model 512, for $155 in 500 quantities.

For more information, contact Epson America, Inc., 23844 Hawthorne Blvd., Torrance, CA 90505; (213) 378-2220. *Circle No. 138.*

General Robotics Corporation offers a **DMA floppy disk system** for the LSI-11. The new product, called the FD/X3, was available for delivery in June 1978.

The floppy disk subsystem consists of three double sided double density drives, each containing 1.25 megabytes of data for a total on line capacity of 3.75 megabytes. The controller uses a DMA interface to the LSI-11 bus to obtain prolonged data rates in excess of 500K bits per second.

The central processor is an LSI-11/2 with the EIS/FIS arithmetic unit. The memory consists of 62K bytes of MOS RAM. A real time line clock enables the user to synchronize tasks to real time events. A serial asynchronous I/O port provides interfacing capability with RS232, 20 mA, or TTL type devices. A 16 slot backplane allows room for 9 expansion slots. For users who wish to store programs in PROM, empty sockets are provided on the bootstrap module for additional PROM or EPROM capability. The bootstrap module also contains firmware diagnostic programs for easy fault location and diagnosis.

The system software for the FD/X3 is the DEC RT-11 operating system and license. The software includes file utilities, assemblers, macro-assemblers, linkers and loaders, and will support higher level languages such as APL, FORTRAN, BASIC, and DIBOL.

The FD/X3 is priced at $11,000 in single quantities, F.O.B. Hartford, WI. The price in quantities of 20 systems with a Run Time RT-11 monitor is $7500 System options include printers, CRTs, hardcopy terminals, cartridge disks and a variety of special purpose interfaces. Software options include higher level languages such as APL, FORTRAN, BASIC and TSX, a time sharing operating system.

For more information on the new FD/X3, or the CD/X3 (20 Megabyte cartridge disk system) or MVT/X3 (desk top computer system), contact Donald D. Woelz, National Sales Manager, General Robotics Corporation, 57 North Main Street, Hartford, WI 53027; (414) 673-6800. *Circle No. 137.*

Dynabyte, Inc. offers its **Naked Terminal**, an S-100 module that functions with a keyboard and video monitor.

The Naked Terminal displays 80 characters on 24 lines using both upper and lower case characters in a 5x7 font.

Half duplex, full duplex and a block mode that allows editing before transmission are features of the Naked Terminal. The more expensive dumb terminal does not have block mode. Editing is aided by an addressable cursor.

Switch-selectable features include black-on-white or white-on-black, blinking or non-blinking underline cursor, and variable baud rates.

No software is required. The Naked Terminal can be configured by dip switch to drop into an existing system, replacing the serial I/O card and stand-alone terminal without making any changes to software.

The Naked Terminal is a complete dumb terminal on an S-100 board. It contains a microprocessor and its own memory, software drivers and internal bus. It will not take up any of the 64K memory space on an S-100 bus.

The Naked Terminal is completely assembled, socketed, tested and burned in. Dynabyte offers a full year warranty.

For more information, contact Rick Mehrlich, Marketing Director, Dynabyte, Inc., 4020 Fabian, Palo Alto, CA 94303; (415) 494-7817. *Circle No. 136.*

A bus addressable digital panel display compatible with 8- and 16-bit microprocessor systems has been introduced by Pichler Associates of Littleton, MA.

The Pichler DP08 is an 8-digit, bus addressable panel display with its address encoded in the bus connector to facilitate interchanging or replacement without internal adjustment or rewiring. This permits virtually unlimited system configurations. Binary weighed, address select lines allow up to 32 of the PIA compatible displays to operate from the same 9 wire signal bus. Once addressed, the display accepts up to 8 BCD encoded digits from the bus at 200K digits per second, and stores them in a RAM for subsequent display. While accessing the RAM, the unit automatically blanks.

Available in table top and front/rear panel-mount versions, the Pichler DP08 measures only 5" x 2" x 6" with easy to read 0.31" x 0.25" LED characters. Both can be supplied with an optional, integral thumbwheel for address selection. For multiplexing one to 32 DP08's on a long distance serial line, Pichler offers the baud rate selectable DPMX08-A ASCII-Coded Serial Current Loop to DP08 Parallel Bus Converter.

The Pichler DP08 is priced from $215 depending on configurations; the DPMX08-A from $320. For more information contact Pichler Associates, Peter Martin, Director of Engineering, 410 Great Road, Littleton, MA 01460; (617) 486-8948. *Circle No. 125.*

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Your business may be manufacturing, engineering or designing panel meters. Or your "business" may be looking for fun ways to improve your golf game – play chess – even make the perfect martini. Whatever your business may be – the computer can be your partner. Let Personal Computing show you how to mind your own business and have fun, too.

Personal Computing

Okidata Corporation has announced the Slimline Series of **line printers.** The new microprocessor-controlled 300, 250, 160 and 125 LPM units feature program controlled font selection, stored program diagnostics and a choice of plug-compatible interfaces.

The new 132 column 300 and 160 LPM models print 7 x 7 characters. The 250 and 125 LPM units print 5 x 7 or 9 x 7 characters. Users may change fonts on command, selecting from twelve different styles including true lower case, double height, double width and double height and width. Graphics capability is also offered. Microprocessor-based RS232 and plug-compatible interfaces are available for popular CRTs, minicomputers and microprocessors.

Features include stored program machine history and a 500,000,000 character head warranty. Self-Test printouts start with a coded header which identifies machine options and revisions and eliminates the service delays caused by searching customer installation records.

The attractive Slimline units are slightly larger than an office typewriter, measuring 23" wide by 22" deep by 10" high for the 300 and 250 LPM models and 8 1/2" high for the 160, and 125 LPM units. Centronics, Dataproducts and other parallel interfaces are offered. A microprocessor-based RS232 interface is also available with seven switch-selectable protocols, seven switch-selectable speeds, auto answer and a choice of buffer sizes.

Deliveries of the 125 and 160 LPM models started this summer. The first shipments of the 250 and 300 LPM units will be in the fall with full production scheduled for the end of the year. Prices for the 300 LPM model are under $2500 in 100 quantities.

For more information, contact Okidata Corporation, 111 Gaither Drive, Mount Laurel, NJ 08054; (609) 235-2600. *Circle No. 121.*

Perkin-Elmer's two CRT terminals, the Model 1100 and OWL-1200, and its new PUSSYCAT CRT Page Printer now offer **seven international character sets** for all major European languages.

"The new character sets include British, German, French, Danish/Norwegian, Swedish, Spanish and Cyrillic and are part of a strong thrust into terminal markets outside the U.S.," according to Terminals Division General Manager James R. Folts.

"Both the CRTs and the printer utilize a high-resolution 9 x 12 character matrix, which displays quite clearly the various special vowels and symbols required by these languages," said Folts. "The Model 1100 and 1200 CRTs complement this high character resolution with a high quality monitor and extensive arrangements to minimize glare, guaranteeing excellent readability."

For more information, contact Perkin-Elmer at Randolph Park West, Route 10 & Emery Ave., Randolph, NJ 07801; (800) 631-2154. *Circle No. 122*

An **integrated small computer system with four full-size floppy disks online** has been introduced by Processor Technology Corporation.

The new system, Sol System IV, includes the company's Sol-20 mainframe with 50,176 8-bit words of RAM memory, a Helios II Model 4 Disk Memory System, PTDOS Disk Operating System, Extended Disk BASIC, a video monitor and complete documentation. Total mass storage capability on four formatted disks is 1.5 million bytes.

The PTDOS Disk Operating System offers advanced functions including complex editors, assembler, device-independent files and random indexed files.

Extended Disk BASIC was designed to obtain maximum performance from Sol/Helios hardware. The video display can be addressed randomly to any position on the screen so one can easily write powerful forms control procedures. Extended BASIC includes string and advanced file functions, timed input, complete matrix algebra, base 10 and rational logarithms, trigonometric functions, exponential numbers and 8-digit precision.

In addition to Extended BASIC,

Processor Technology offers Disk FORTRAN and Disk PILOT languages as low cost options.

Suggested domestic price for Sol System IV fully assembled and factory tested is $7995. Delivery from Sol computer dealers throughout the United States, Canada and internationally is stock to 90 days.

For more information, contact Processor Technology Corporation, 7100 Johnson Industrial Drive, Pleasanton, CA 94566; (415) 434-2244. *Circle No. 123.*

Talos Systems has a **low-cost digitizer sold in kit form**, consisting of two circuit boards, components, pen-like stylus and working surface. The unit measures 15" x 15" x 1" when completely assembled, and supports an 11" x 11" active digitizing area.

The digitizer specifies 200 lines per inch (0.005") resolution and outputs 100 coordinate pairs per second. Point and Continuous operating modes are switch selectable, and the unit never requires any alignment or calibration, according to Talos.

Typical applications include interactive graphics, cartography, computer-aided design, mathematical analysis, games, menu data entry and CRT cursor control.

Standard output is 16 bit parallel binary; RS232 is optional. The kit can be ordered directly for $395.00. For more information, contact Talos Systems, Inc., 7419 East Helm Drive, Scottsdale, AZ 85260; (602) 948-6540. *Circle No. 131.*

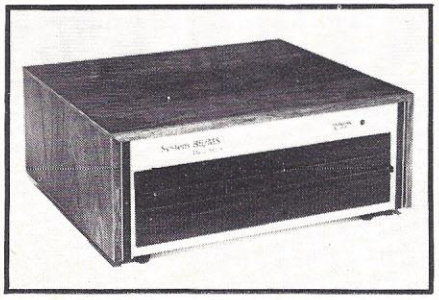
PolyMorphic Systems has increased the storage capabilities of its System 88 microcomputers through a new option, the 88/MS.

The 88/MS consists of **two drives for 8-inch magnetic storage disks** in a walnut cabinet with brushed aluminum front panel that matches other products in PolyMorphic's System 88 line.

The 88/MS makes possible mass storage through the use of disks that are not only larger than mini-floppy disks but will store twice as much information per square inch and store it on both sides. One disk can hold 1.2 Mb – more than 500 pages of text.

A System 88 microcomputer with one or two 88/MS units will handle all the files and processing needs of most small businesses and professional offices.

Present owners of any System 88 microcomputer can add the 88/MS mass storage unit with no changes in their equipment's operating system. Ready-to-use packages for doing such tasks as accounts receivable are available.



For more information, contact PolyMorphic Systems, Inc., 460 Ward Drive, Santa Barbara, CA 93111. *Circle No. 124.*

A 10-megabyte **cartridge disc subsystem** for the microNOVA computer family was announced today by Data General Corporation. The Model 6095 Cartridge DG/Disc combines five megabytes of fixed and five megabytes of removable storage for integral system backup. Complete subsystems are priced at $8900. The Model 6095 Cartridge DG/Disc consists of an in-house designed and manufactured cartridge subsystem that attaches to the microNOVA processor via its 16-line I/O bus. Deliveries are 90 days ARO.

Each disc incorporates fixed/removable discs, a 5-megabyte fixed disc platter and a 5-megabyte removable cartridge. A single spindle drives both discs and each disc surface has a corresponding read/write head. The data channel controller is physically part of the drive.

Systems using the new disc have software support under Data General's Operating System (DOS). DOS provides a medium-scale program development or program environment on a small-scale system. It offers buffered and unbuffered I/O and device independent file transparency; comprehensive disc file management; high-level language support; and extensive utilities.

Specifically, DOS supports FORTRAN IV, single/multiuser BASIC and Business BASIC high-level languages, RJE80 (2780/3780) and HASP II communication emulation packages; communication access manager (CAM) and sensor access manager (SAM) I/O

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#5680-X, paper, $7.95 (tentative)

Home Computer Systems Handbook (Libes)
A primer covering the practical knowledge you should have to be able to intelligently purchase, assemble, interconnect, and program the microcomputer. #5678-8, paper, $8.45

The 6800 Microprocessor: A Self-Study Course with Applications (Leventhal)
A self-teaching introduction to the popular 6800 microprocessor, containing 15 lessons that emphasize the control applications of microcomputers.
#5120-4, paper, $5.95

APL: An Introduction (Peelle)
Teach yourself the APL language by using this book — with or without a computer! Includes many examples of APL expressions and selected exercises.
#5122-0, paper, $7.50 (tentative)

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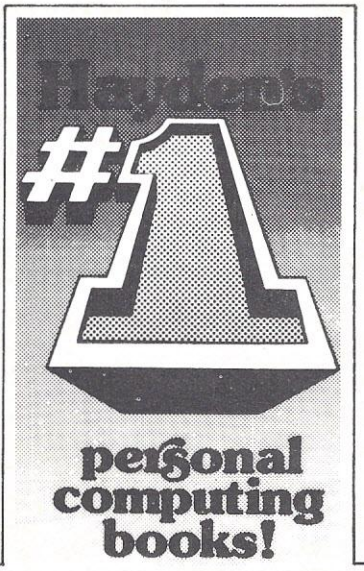

CIRCLE 23

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DECwriter III	2,695	137
DECprinter I	1,795	92
VT52 DECscope	1,695	85
VT100 DECscope	1,695	85
VT55 DECgraphic CRT	2,395	122
TI 745 Portable	1,875	94
TI 765 Bubble Memory	2,995	152
TI 810 RO Printer	1,895	97
TI 820 KSR Terminal	2,395	122
ADM 3A CRT	875	45
HAZELTINE 1400 CRT	845	43
HAZELTINE 1500 CRT	1,195	61
Data Prod. 2230	7,900	395
QUME Ltr. Qual. KSR	3,195	163
QUME Ltr. Qual. RO	2,795	143
DATAMATE Mini Floppy	1,750	89

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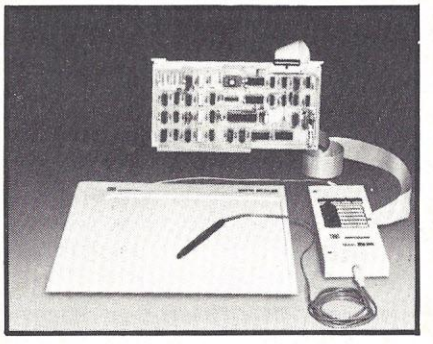
utilities; and macro assembler, editors, relocatable linking loader, symbolic debugger, software library and development utilities.

Specifications of the Model 6095 Cartridge DG/Disc include 408 tracks per surface, 12 sectors per track and 512 bytes per sector. Head positioning time is 38-milliseconds average and a maximum of 8-milliseconds track-to-track. Data is fully buffered by sectors and transfers at the rate of 312,000 bytes per second.

For more information, contact Data General Corporation, Route 9, Westboro, MA 01581; (617) 366-8911. *Circle No. 135.*

Summagraphics announces a new version of its popular low-cost Bit Pad, the **digitizer for small computer systems.** The new Bit Pad configuration is Intel Multibus compatible. The Bit Pad can now be plugged into the Multibus along with single board computers (SBC), memory and I/O boards, peripherals and controllers.



All electronics are located on one SBC card. Operational control and status indication is provided from a small, hand-held console. The system also includes an 11" x 11" Bit Pad tablet and a data input stylus. The basic Multibus Bit Pad configuration carries a retail price of $625.

For additional information, contact Summagraphics Corporation, 35 Brentwood Avenue, Fairfield, CT 06430, Telephone: (203) 384-1344. *Circle No. 127.*

General Logic, Inc. a subsidiary of Standard Logic, Inc. announces the FD-8200T NOVA Compatible **Floppy Disk System.** Hardware, software and media compatible with the Data General line of NOVA minicomputers, the self-contained FD-8200T comes in either single or dual drive configurations and may be supplied with single sided or dual sided drive mechanisms. Up to four single sided drives per controller may be implemented with an expansion chassis.

All units are available in either rack mount or table top assemblies and come complete with power supply, enclosure with full LED status display and I/O cables. Delivery is 30 days ARO. Quantity one price for Dual Drive Configuration is $3500.

For more information, contact Frank C. Phillips, Marketing Manager, General Logic, Inc., 2215 Standard Ave., Santa Ana, CA 92707; (714) 979-4770; outside CA (800) 854-3024. *Circle No. 126.*

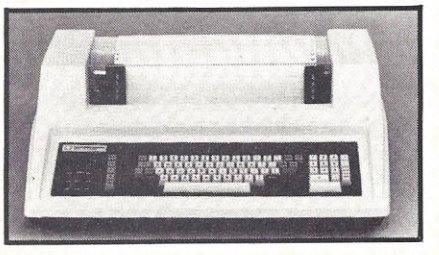
Texas Instruments Incorporated announced **a low-cost, quiet electronic data terminal,** the Model 820 Keyboard-Send Receive (KSR) Terminal.

Following the Model 810 Printer introduced 18 months ago, the Model 820 Terminal broadens TI's product offerings for the data entry computer input/output and the fast growing 1200-baud timesharing markets, TI said.

The 820 features quiet operation, 150-cps printing of an original and five highly legible copies with a 9 x 7 dot matrix format, a full 128-alphanumeric character ASCII keyboard, a 640 character FIFO buffer and answerback memory. Other standard features include keyboard selectable baud rates, a preprogrammed self-testing capability and serial asynchronous data communication at rates from 110 to 9600 baud.

A TI spokesman said that the below 60 dBA noise level for the new terminal is expected to be a strong selling feature of the 820.

The 820's latest microprocessor design technology provides microprocessor control of printing functions, programmable forms control and a buf-



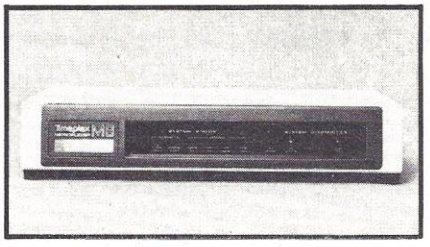
fered communications interface.

The 820's options include a compressed character font, numeric cluster, full ASCII/APL keyboard, international character sets, and device/forms control.

A table-top unit, the Model 820 KSR Terminal weighs only 40 pounds and is 26" x 8.25" x 21". Production deliveries are scheduled to begin in the third quarter, 1978. The 820 is priced at $2,395 (U.S. domestic) in quantity one with OEM discounts available.

For more information contact Texas Instruments Incorporated, Digital Systems Division, P.O. Box 1444, M/S 784, Houston, TX 77001, (713) 491-5115, X2124. *Circle No. 129.*

Timeplex, Inc. introduced its microplexer, a series of **statistical multiplexers**, at the 1978 National Computer Conference in Anaheim, CA. The first two models, the M4 and the M8, combine either 4 or 8 asynchronous inputs of 110 to 2400 bps over a single



data link line of 1200 to 9600 bps. Equipped with a data buffering capability, microplexers allow, for brief periods, a cumulative data transmission rate well above the theoretical capacity of the transmission line.

Microplexers feature internal microprocessors that run continual diagnostic programs and then display the existence of any fault condition. In addition, microplexers use a reliable ARQ – Error Correction System – to eliminate data transmission errors caused by noisy telephone lines and faulty modems.

With the use of software demultiplexing, microplexers can act as terminal cluster concentrators that feed multiplexed data directly into a computer or front end processor. This application can result in significant savings in the cost of computer ports.

A complete four-channel model, M4 is priced at $1750 and the eight-channel model M8 at $2750. Options include built-in modem. Delivery is quoted at stock to 30 days ARQ. OEM and Quantity discounts are available.

For more information, contact Timeplex, Inc., 100 Commerce Way, Hackensack, NJ 07601; (201) 646-1155. *Circle No. 128.*

An **interactive computer terminal** from Britain consists of a panel of LEDs which can be turned on or off when a fiber-optic pen is pointed at them. Developed for commercial and industrial use, Truedata serves the functions of a data input keyboard, visual display unit and printer; it does not require an operator proficient in keyboarding or computer language, and it reduces risk of data error.

The new terminal was launched at Electro '78 in Boston, and shown in June at the National Computer Conference in Anaheim.

By pointing a pen at an LED on the terminal one can put a question to the computer, which responds by lighting or extinguishing LEDs and/or illuminating a numeric display on the panel.

A unit contains either 128 LEDs, or a more densely packed 256. The LEDs required for a particular application are annotated with words, numbers, foreign language characters, colors, drawings or symbols printed on an overlay of metal, paper, film or plastic which covers the panel.

With a 12" x 8" display area, the 11-lb. terminal can be a freestanding desktop unit – positioned in an attitude of either 30° or 60° from the horizontal – or console-mounted.

Truedata can be adapted for many applications, such as survey data capture, maintenance scheduling, flow diagram presentation, seat reservation and inventory and stock control.

For more information, contact Grundy & Partners Ltd. (Mr. Martin J. Clements, Data Communications Products Manager), Bond's Mill, Stonehouse, Gloucestershire GL10 3RG England; Stonehouse (045 382) 3611. *Circle No. 133.*

A **microprocessor program loader** has been developed by the Sealectro Corporation.

The low cost program reader reads 22 columns of a standard 12 x 80 tab card or a 12 x 22 column plastic badge where data durability is desired. A series of cards or badges can be rapidly inserted where batch loading is desired.

Construction is all plastic. Sensors are solid state photo optical. Output is TTL or CMOS compatible.

For more information contact the Programming Devices Division of Sealectro Corporation, Mamaroneck, NY 10543; (914) 698-5600. *Circle No. 132.*

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CIRCLE 25

Software

An on-line, interactive system for patient billing and insurance form preparation for doctors, dentists and clinics for use as an in house or timeshared system is now available on the Datapoint 550 or 6600 from Occidental Computer Systems, Inc.

The system develops a comprehensive Data Base for the patient master and transaction history files and utilizes the PROFILE technique for each user to establish control parameter files for each doctor, dentist or clinic utilizing the system. This PROFILE allows each user to tailor the system options to its particular requirements as to account retention, delinquency control, statement and insurance form preparation and financial reporting structure, while the host system processes all users concurrently with the same programs.

Each user may also create its own fee schedule and procedure file using RVS or CPT formats or a user originated code. Also, each user may have its own file for diagnoses, revenue centers and insurance companies, as well as recall messages.

All files are created and reports selected via menu selection on the user's video display. The user may select reports such as account aging, collection reports, account balance reports, charge and receipt journals, daily and monthly receivable recaps, recall notices, financial analysis summaries, patient statements, and insurance forms.

For further information contact: Paul D. Marchetti, President, Occidental Computer Systems, Inc., 10202 Riverside Drive, North Hollywood, CA 91603; (213) 763-5144. *Circle No. 144.*

Path Systems, Inc., announces the availability of XL/MU-11, **a disk based multiuser operating system.** Designed to run on PDP-11 family computers, XL/MU-11 can be used on very small PDP-11 configurations and is valuable for controlling real-time applications as well as a program development tool. As a real-time applications monitor, the XL/MU-11 task scheduler supports simultaneous multi-tasking applications, task queuing, inter-task communication and locking or unlocking of resources.

For program development, XL/MU-11 includes a full complement of system programs and utilities for editing, assembling and linking. It can support up to seven terminals conforming to the standard DEC, DR11, DL11 or DC11 asynchronous interfaces. The XL/MU-11 requires only 5-6K of core and has a sophisticated swapping mechanism for rolling user partitions between memory and disk. The rolling partition feature allows different users to share the same physical area of core without being aware of each other's presence. In addition partitions can be swapped out while its I/O continues to operate.

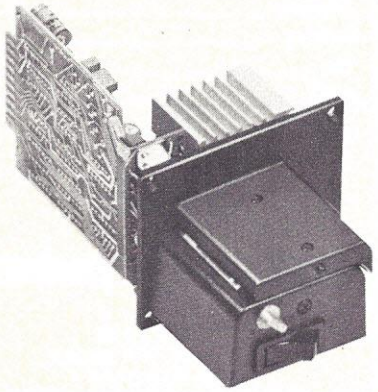
Available now, the XL/MU-11 starts at $1,500 with a discount schedule for OEMs. For further information, contact Path Systems, Inc., 333 N. Turner St., Manchester, NH 03102; (603) 625-9662. *Circle No. 134.*

The COSMAC **1802 simulator program** enables a 6502 microprocessor to execute the COSMAC 1802 instruction set. The simulator does this by interpreting COSMAC instructions in a normal program sequence. All internal COSMAC registers are available for examination. They may be viewed statically in a single-step mode or dynamically in a trace mode. All COSMAC software features are presently supported with the exception of direct memory access (DMA).

The COSMAC 1802 Simulator is now available in a KIM-1 version which turns a KIM-1 into a development and debugging tool for COSMAC software. It will run on a KIM-1 with no additional hardware or software required. In its minimum configuration the simulator leaves two full pages of memory open for COSMAC programs. Alternative run mode features take up an additional (optional) 1/2 page. The simulator can be relocated in ROM and can be readily adapted to other 6502 based systems.

A complete package is available containing a KIM-1 format cassette tape, a user manual, and a complete, well commented assembly level source/object listing. Priced at $10.00 + $1.50 postage

601 Reader
Stops on character
Stepper motor
Reads 150 characters/second



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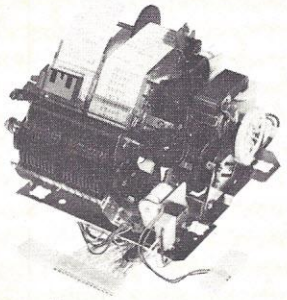

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CIRCLE 26

and handling, it may be ordered from: Dann McCreary, 4758 Mansfield St. #2T, San Diego, CA 92116. *Circle No. 159.*

A totally new operating system designed to utilize the advanced hardware features incorporated in the Naked Mini 4 Family of OEM minicomputers was introduced today by the Naked Mini Division of Computer Automation, Inc.

The **Naked Mini 4 Operating System (OS4)** is a disk-based single user development system based on a common real-time executive (RTX4/IOS4) and file manager (SFM). This is a significant development for users, for all CAI software is now based on a single common subsystem, simplifying programming considerations for all CAI customers.

"This product not only simplifies the program development task for our users, but, additionally, provides them with increased performance, which helps reduce development time," stated George Dashiell, General Manager of the division.

OS4 provides the programmer with a number of program development commands from a library that includes: a source editor for creating and/or editing symbolic source text; a line editor for adding, deleting and replacing lines of text; a macro assembler for translating source text into object code; a debugging module (DEBUG4) for debugging user programs; a LINK, for linking object program modules.

Two additional features designed to make OS4 convenient to implement and use include device independence and a versatile disk file manager. Since the I/O system is logical unit oriented (as opposed to physical unit oriented), dynamic description of the actual user run-time configuration adapts OS4 to every possible user combination of processor and peripherals. The disc file manager facilitates creation and processing of named symbolic and binary files with file name extensions.

The operating system runs on any Naked Mini 4 Family member, including the Models 4/10, 4/30 and 4/90, with at least 32K words of memory and a disk device. OS4 can also be used on machines equipped with 64K words of storage. For customer convenience, OS4 operates in either batch or interactive mode.

OS4, containing the Source Editor, MACRO assembler, PASCAL compiler, LINK and DEBUG4 modules, is distributed in object format on floppy diskettes. It is priced at $2,000. Editions for 5-megabyte and 10-megabyte cartridge disk-equipped systems are available for an additional $200. Shipments to customers began June 30. For more information, contact Computer Automation, 18651 Von Karman, Irvine, CA 92713; (714) 833-8830. *Circle No. 162.*

A program to stimulate the exchange of system and applications software between its customers has been launched by Micropolis Corporation.

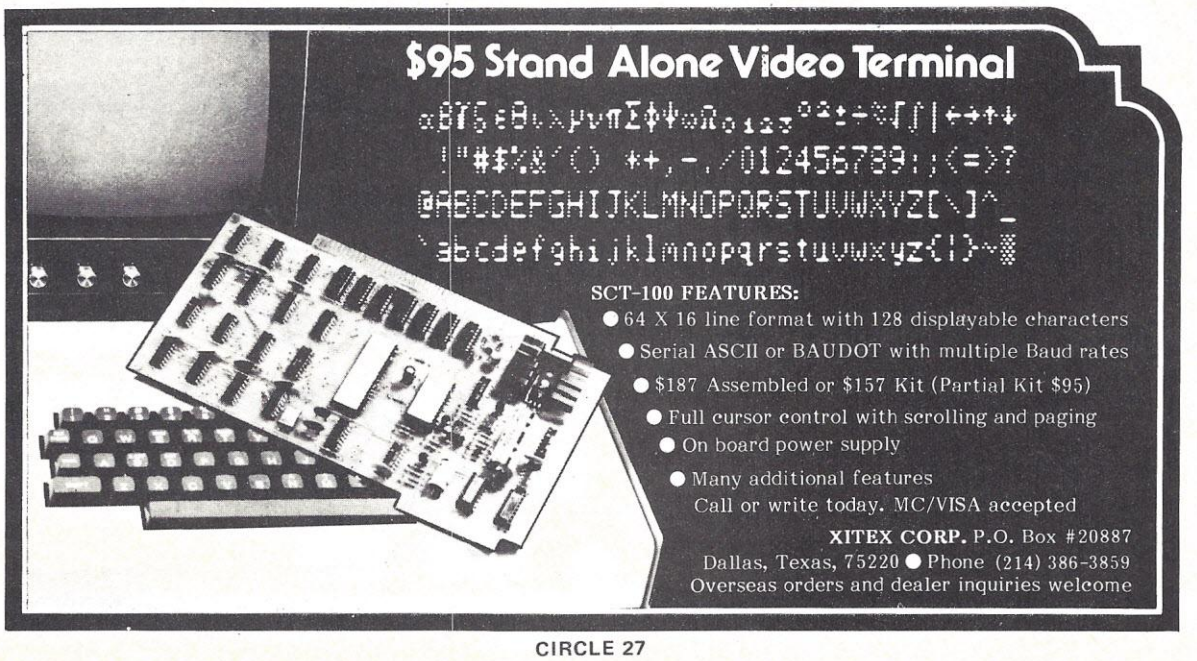
The company is distributing the first edition of a newsletter which will be the principal forum for providing information on user-developed software packages. Customers may further make direct inquiries to Micropolis for possible sources of specific packages, and participating computer stores will be provided information.

The initial newsletter describes CP/M disk operating systems available from three vendors, according to Robert T. Chisum, Micropolis marketing manager. The new DOS packages, developed for standard S-100 software buses, provide the user with flexibility in applications programs and language selection, such as FORTRAN and BASIC.

"CP/M has become the most widely used S-100 floppy disk operating system," Chisum said, "with features such as dynamic allocation of diskette storage; relocatability of system in memory; intrinsic commands to save, rename, erase and display directories of files; and complementary context editor, assembler and dynamic debugging program."

Micropolis will focus its software development activities on further expanding and improving existing software and creating system software for new products, according to Chisum.

"In most cases, Micropolis will merely serve as a referral point to match vendor for sale listings with customer needs. On a selective basis,



CIRCLE 27

we will, with vendor cooperation, run hands-on tests in order to make a more definitive evaluation."

Programmers who have developed software for a Micropolis floppy disk should write the company for a copy of its referral questionnaire or obtain a copy of the first newsletter in which the form is reproduced.

For more information, contact Jim Molenda, Micropolis Corporation, 7959 Deering Ave., Canoga,Park, CA 91304; (213) 703-1211. *Circle No. 148.*

ROLM Corporation's Telecommunications Division announces a low-cost option of Release 5 of the ROLM CBX **Business Telephone System software** that enables small and medium size companies to install private CCSA-type switching systems.

ROLM's network uses the standard 7-digit numbering plan for inter-office calls and 10-digits for off-net calls; it can be retrofitted into existing CBX installations.

The system has the capability to go off network at the end points as well as the hubs, according to a company spokesman.

When an extension in a PBX or CBX wants to call another location on the network, the user simply dials an "8" plus that location's office code plus the 4-digit extension number.

The ROLM CCSA System can also be used for regular long distance traffic, according to ROLM. The phone user simply dials "9" plus the number desired, including area code. ROLM CBX Route Optimization takes it from there. Call queuing can be used for making off- or on-net calls.

Automatic Network Dialing (AND), another recently introduced option of Release 5, can also be used with the CCSA Switching System if a dial-tandem network (not necessarily a 7-digit numbering plan) is linked into the CCSA network.

The new software option can be added to any CBX (100 to 800 lines) or LCBX (800 to 1500 lines.)

CCSA Switching Systems and additional Release 5 options will be available in the Fall. Software prices vary according to the user's requirements and local tariffs.

For more information contact ROLM Corp., 4900 Old Ironside Dr., Santa Clara, CA 95050. (408) 988-2900. *Circle No. 114.*

For the user of the Intellec microcomputer development system who wants to upgrade to a more sophisticated microprocessor development lab for 8080-based prototypes, Tektronix is now offering an 8080 CONVERT program. With this program, users of the Intellec MDS 800 can retain already developed programs when adding or switching to a Textronix 8002 Microprocessor Lab.

The 8002 has advantages over the Intellec MDS 800 for 8080 emulation in that real-time emulation is possible when sharing memory between prototype and development systems, and real-time prototype analysis is available, according to Arnold Karush, Product Manager for Microprocessor Labs. In addition, when the designer wants to employ

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other microprocessors, the Tektronix unit provides the capability to work with most popular microprocessors it is not constrained to just the 8080.

The Tektronix 8080 CONVERT program translates 8080 programs from Intel's 8080 macro assembler format to Tektronix 8080 assembler format. The input to the program is source code written in Intel's assembly language; the output is source code written in Tektronix assembly language. This output is then acceptable as input to the Tektronix 8080 assembler although it can be edited if desired and can be assembled into 8080 object code.

Input to the CONVERT program may come from many peripheral devices, including the 8002 Microprocessor Lab's flexible disc file or terminal console. Each Intel assembly language statement field (label, operation, operand and comment) is replaced by a valid Tektronix field. This conversion reconciles the differences in the assembly languages such as the reserved symbols, directives and expression operators. Often, the user will be able to assemble the converted code without rewriting any code although a few incompatibilities exist that might require minor editing. These are indicated in the CONVERT documentation, according to Karush.

To help the 8080 user develop complex software, the 8002 Microprocessor Lab assembler provides a flexible macro capability which makes it easy to write complex macros with varying number of parameters in a macro call, macro parameter substitution in all fields, and macro parameter calls by name rather than just by value.

The assembler also has a powerful string manipulation capability. Since the 8002 has a macro-assembler that generates relocatable code, the user may link parts of existing programs to each other or to new programs. Therefore, the user can run his existing, converted Intel 8080 program as is or excerpt parts of it for inclusion in new programs, Karush points out.

The CONVERT program is offered at no additional charge with the Tektronix 8080 software. The assembler manual details the differences between Intel and Tektronix assembly languages.

For further information on the CONVERT program contact Tektronix, Logic Development Products, P.O. Box 500, Beaverton, OR 97077; (503) 644-0161. *Circle No. 115.*

Connecticut microcomputer announces a word processor program for the Commodore Pet. This program permits composing and printing letters, fliers, ads, manuscripts, articles, etc., using the Pet and an RS232 printer.

Script directives include line length, left margin, centering, and skip. Edit commands allow the user to insert lines lines, delete lines, move lines, change strings, save onto cassette, load from cassette, move up, move down, print and type.

The Word Processor Program may be purchased from Connecticut microComputer, 150 Pocono Road, Brookfield, CT 06804 for $29.50 postpaid. *Circle No. 199.*

NEW SOFTWARE AVAILABLE FOR

MICROPOLIS™

The following software is now being offered for use on the Micropolis MetaFloppy and MacroFloppy disk systems.

CP/M™ FDOS and Utilities		From $145
Microsoft FORTRAN-80		$400
Microsoft COBOL-80		$625
Microsoft Disk Extended BASIC		$300
Xitan SUPER BASIC	(A3)	$99
Xitan DISK BASIC	(A3+)	$159
Xitan Z-TEL Text Editor	(A3, A3+)	$69
Xitan Text Output Processor	(A3, A3+)	N/A
Xitan Macro ASSEMBLER	(A3, A3+)	$69
Xitan Z-BUG	(A3+)	$89
Xitan LINKER	(A3+)	$69
Xitan Package A3 (as keyed above)		$249
Xitan Package A3+ (as keyed above)		$409
Xitan Fortran IV		$349
Xitan DATA BASE MANAGEMENT SYSTEM		$1,250
CBASIC Compiler/Interpreter BASIC		$95
MAC Macro Assembler		$100
SID Symbolic Instruction Debugger		$85
TEX Text Formatter		$85
BASIC-E Compiler/Interpreter BASIC		$30
General Ledger		$995
Accounts Receivable		$750
NAD Name & Address Processor		$79
QSORT Disk File Sort/Merge Utility		$95

NEW SOFTWARE AVAILABLE FOR

NORTH STAR ★ COMPUTERS

The following software is now being offered for use on the North Star disk systems and Horizon Computers.

CP/M™ FDOS and Utilities		From $145
Microsoft FORTRAN-80		$400
Microsoft COBOL-80		$625
Microsoft Disk Extended BASIC		$300
Xitan SUPER BASIC	(A3)	$99
Xitan DISK BASIC	(A3+)	$159
Xitan Z-TEL Text Editor	(A3, A3+)	$69
Xitan Text Output Processor	(A3, A3+)	N/A
Xitan Macro ASSEMBLER	(A3, A3+)	$69
Xitan Z-BUG	(A3+)	$89
Xitan LINKER	(A3+)	$69
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Xitan Package A3+ (as keyed above)		$409
Xitan Fortran IV		$349
CBASIC Compiler/Interpreter BASIC		$95
MAC Macro Assembler		$100
SID Symbolic Instruction Debugger		$85
TEX Text Formatter		$85
BASIC-E Compiler/Interpreter BASIC		$30
Accounts Receivable		$750
NAD Name & Address Processor		$79
QSORT Disk File Sort/Merge Utility		$95

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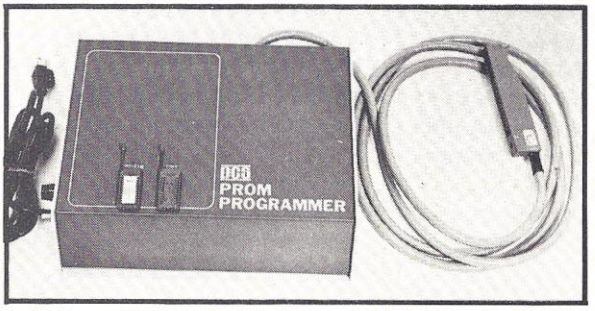
SuperPac's **Development System** (SPDS) can now develop programs for Micropac. Originally designed to support OEM and other industrial microcomputer applications, PCS's SPDS now serves the modular MicroPac as well. A simple change of EPROM Programmer makes the following EPROMs available: 1702, 2708, 2716 and 2732.

The SPDS (and its Z80 option) supports both Z80- and 8080-based target systems with a CPU-independent software package which includes cross reference generator, absolute and relocatable macro assembler, relocatable linking loader, source editor, floppy operating system and up-down loader which can pass software directly to any PCS target system up to 1000 feet away.



PCS EPROM Programmers read and verify object tapes, program EPROMs from RAM or the COPY socket, compare EPROMs with RAM or the copy socket, transfer EPROM information into RAM, allowing examination and modification of RAM, punch and load BNPF tapes, allow examination of EPROMs and quick copy from COPY socket.

The PB1000 EPROM Programmer Kit, which makes MicroPac program development possible on the SPDS, is available for $940 (software included). Delivery is 30 days ARO. For more information, contact Process Computer Systems, Inc., 750 N. Maple Rd., Saline, MI 48176; (313) 429-4971. *Circle No. 111.*

To meet the performance **management requirements of IBM's Customer Information Control System** (CICS and CICS/VS) users, Boole & Babbage has introduced CONTROL/CICS. The new product will aid data processing management in improving communications with users, forecasting future resource requirements and improving the level of service to users, according to the company.

William P. Sundin, product manager, noted that performance in the teleprocessing environment requires constant attention and is directly related to usage of system resources. Poor utilization leads to poor response time, system deterioration and user morale problems.

This management-oriented performance and ac-

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counting system helps determine if service level commitments are being met and whether user workload forecasts are being met. A simulation feature also predicts what effect hardware changes will have on performance.

Sundin commented that CONTROL/CICS will help management and technical personnel improve user communications, planning, forecasting and accounting. The product provides trend graphs, distribution graphs, exception reports, simultaneity reports, simulation reports and response time reports daily and monthly. It also provides usage reports on transactions, programs, resources and file usage as well as calendar reporting.

Rather than developing volumes of performance data, CONTROL/CICS concentrates on collecting only useful data and presenting it in easy-to-use reports and graphs, the company said. This procedure simplifies performance analysis and helps identify areas for performance improvement. In addition, CONTROL/CICS helps explain and/or justify long response time, identify "worst case" resource users and plot activity over time.

Sundin added that the system provides data center management with a tool for improving their communications with users by providing non-technical reports and graphs. It also aids them in long-range planning, performance management and forecasting. For the technical staff, CONTROL/CICS provides detailed information on response time distribution, excessive resource usage and simultaneity.

For more information, contact Boole & Babbage, Inc., SMS Division, 510 Oakmead Parkway, Sunnyvale, CA 94086; (408) 735-9550. *Circle No. 112.*

COMPAS of Ames, IA, announces the availability of two **software packages for the 6500** microprocessor family made by Rockwell, Synertek and MOS/Technology. These packages are a text editor (E/65) and two-pass assembler (A/65) designed to run on any 6500 based system. Both programs are similar to software written by COMPAS staff and offered in the Rockwell System 65. Each program is designed with transfer vectors to link the program to I/O routines in the users system.

E/65 is primarily designed to edit assembler source code. Line oriented commands specify input/output of text and find specific lines to be edited. String oriented commands allow users to search for and optionally change a text string. Character oriented commands allow cursor positioning and character deletion. Text may be loaded from or dumped to a bulk device other than the system terminal. E/65 also features a second entry point to edit text which is already in memory.

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The arm, torso, and base modules are sold separately or together in a complete kit (shown assembled in photo to the right). The arms have six axes of movement and can manipulate objects weighing 5 lbs. The torso and base can host a microcomputer and batteries. Electronics not included. Send cash, check, or money order now.

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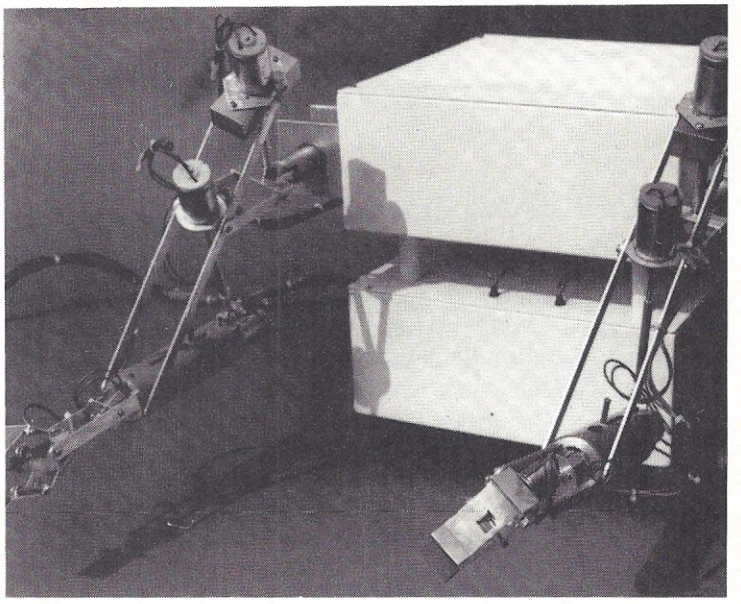

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A/65 is a full two-pass assembler which conforms exactly to the specifications detailed in the Rockwell and MOS/Technology cross assembler manuals. A full range of run-time options are provided to control listing formats, printing of generated code for ASCII strings and generation of object code. Object code may be stored directly in memory or output to a file which may be the same as or different from the listing device. Thus an assembly may be made for listing only, object code only or both.

E/65 and A/65 are priced at $100 each (prepaid) and are supplied in object form on paper tape or KIM compatible audio tape. Listings of the source code are available for $25 each. Programs are assembled to start at memory location 200 (hexadecimal) but may be ordered to start at any other location. Full documentation on the installation and use of each package is provided. For more information, contact COMPAS, 413 Kellogg, Ames, IA 50010; (515) 232-8181. *Circle No.168.*

Zilog, Inc. has introduced a family of **system programming** languages designed specifically for the Zilog family of microcomputers. Intended for use in microcomputer applications, this new language family affords greater efficiency, claims the manufacturer, in program writing, compiling and code generation than high-level languages originally designed for large computer systems.

Designated PLZ, this language is implemented as a set of disk-based programs running in the RIO operating system of Zilog's Z80-based microcomputers. Linkage to other languages, such as BASIC, COBOL and FORTRAN, is simple and straightforward.

PLZ permits systematic combinations of high-level, machine-independent modules with low-level, machine-dependent modules within the same program.

The high-level modules utilize the procedure-oriented PLZ/SYS language. PLZ/SYS blends elements of such other well-known languages as PASCAL, ALGOL, PL/1 and C to provide a medium for expressing algorithms in a high-level, structured fashion. This software allows programmers to concentrate on application problems, rather than on details of computer architecture. PLZ/SYS is easy to learn, use and debug, and requires minimal runtime support.

A structured assembly language, PLZ/ASM, provides all of the low-level programming capabilities necessary for the user to manage such processor resources as registers, memory, accesses and I/O operations. PLZ/ASM also provides control structures and data declarations that encourage more easily maintained and readable modules than other assembly languages.

Initial PLZ program implementation consists of

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the PLZ/SYS Compiler, PLZCG Code Generator, ZINTERP Interpreter, PLINK Linker, PLZ/ASM Translation Filter and PLZ I/O Package.

Zilog, an affiliate of Exxon Enterprises, manufactures and markets microcomputer circuits, boards and complete systems; associated software; and memory devices.

For more information, contact Zilog, 10460 Bubb Road, Cupertino, CA 95014; (408) 466-4666. *Circle No. 169.*

Scientific Systems Services Inc. (SSS) has announced availability of the 3SX-11 **real-time executive program** for the LSI-11. This new software package was developed to meet needs of LSI-11 users for small, efficient – but comprehensive – real-time operating systems.

Possessing the features of larger operating systems, the 3SX-11 fulfills requirements of today's microcomputer user and provides the capability to develop applications without the need to write a special optimized software executive.

Features of the 3SX-11 include CRT handlers, TTY handlers, floppy disc support, I/O queuing and intertask communications linkage. Each user is furnished with complete software documentation plus an extensive "Users Manual".

Price is $395.00 including 30-day consultation and warranty features. Prerequisites are a host system with PDP-11 assembly and basic knowledge of PDP-11 assembly language.

SSS is a computer applications firm specializing in real-time software systems for industry. For more information, contact Bob Chudoba, Scientific Systems Services, 1135 John Rodes Blvd., Melbourne, FL 32901; (305) 725-1300. *Circle No. 151.*

Cromemco's TRACE is a **system simulator program** designed to facilitate assembly language program development on Cromemco computer systems. TRACE emulates the behavior of a Z-80 processor as it follows the logic of the user program.

Virtually all aspects of System Operation can be simulated, says the manufacturer, including prioritized interrupts and I/O commands. TRACE options include control of register display and choice of display frequency. A historical record of program execution is maintained in a 100-instruction circular queue.

Features which help the user locate errors quickly include warnings if the user writes to unexpected areas, simulation of Input-Output commands on the console, warnings of attempts to execute undefined commands, undefined calls to CDOS routines, improper return from subroutine calls and execution of branch instructions or decimal adjust if the relevant flags are in an undefined state.

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Advance features of TRACE enable it to be used in place of logic analyzers or in-circuit emulators in program development.

TRACE is available on 5" (Model TSS-S) or 8" (Model TSS-L) IBM-format floppy diskettes for $95.

For additional information, contact Cromemco, Inc., 280 Bernardo Avenue, Mountain View, CA 94040; (415) 964-7400. *Circle No. 154.*

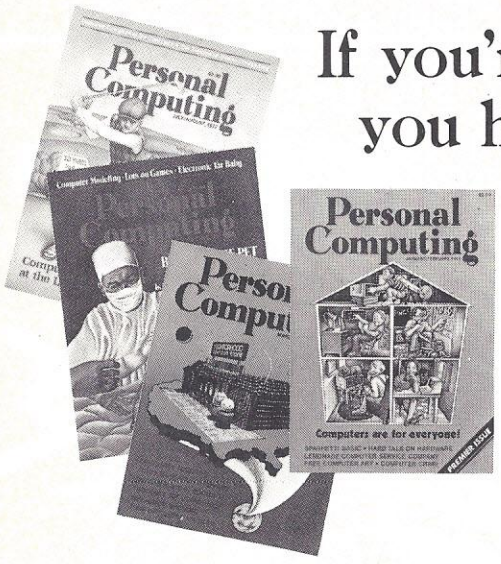
Datapoint Corporation announced an interactive version of its **ANSI COBOL** programming language. Users can now employ COBOL for interactive tasks such as on-line data entry as well as for batch-oriented assignments like report generation.

The efficiency, machine independence and English-like syntax of COBOL have made it among the most popular high-level programming languages, the company said. Datapoint's Interactive COBOL retains all of these features while adding the ability to format screen displays, prompt operators with a range range of visual and audible cues, and accept, reformat, edit and process input data. Other features have also been added. Complete file compatibility with other Datapoint languages such as BASIC, RPGPLUS, DATABUS and DATAFORM is included in Interactive COBOL.

"Businesses can retain their previous investment in batch COBOL programs while adding interactive capabilities at the same time," said Victor Poor, Datapoint's senior vice president of research and development. "Data collection and processing operations can now be conducted exclusively with COBOL."

Interactive COBOL can be used with a variety of Datapoint processors and systems. Programs written in Interactive COBOL can be compiled on any Datapoint processor with disk storage and at least 48K bytes of user memory (5500 and 6600 Advanced Business Processors and 3800 Series and 6000 Series Attached Processors). Compiled programs can be executed on any of the above machines as well as the Datapoint 1150 and 1170 Disperesed Processors. Processors compiling and executing Interactive COBOL can participate in DATASHARE, Datapoint's Business Timesharing System or can become members of the Attached Resource Computer System, Datapoint's computer architecture that electronically links Datapoint processors together to provide functionally dispersed systems of various sizes and configurations.

Special features of the Datapoint 3800 Series Attached Processors enhance the capabilities of Interactive COBOL and the Attached Resource Computer system. Five interactively-programmable function keys can be used for tab and cursor positioning as well as for conditions affecting program branching statements. The 3800 processor's capabilities for in-



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verse video (dark characters on a light background), audible signals and screen blinking by word or by field make for more effective operator prompting. Other Datapoint processors can simulate the operation of the function keys and audible cues and disregard instructions for inverse and blink video.

Additional enhancements to Interactive COBOL make for easier program development and debugging. Interactive COBOL uses the powerful Indexed Sequential Access Method (ISAM) to automatically create and maintain disk files. Adding records to an ISAM file does not require manual file restructuring. Data definition blocks and already-compiled subroutines may be called by Interactive COBOL programs, meaning less programming effort and easier standardization of programs, the company said.

The run-time debugger intergral to Interactive COBOL allows programmers easily to find and fix programming mistakes, according to Datapoint. The debugger enables the programmer to interact with his program as it is executing, and can be used with any program without special preparation. Interactive COBOL can also read from and write to cassette tapes, making off-line storage and data transfer easier.

Users may license Interactive COBOL for a one-time fee of $2500 with discounts available for more than one compiler or a monthly fee of $65. The maintenance, support and documentation fee is $20 per month.

For more information, contact your local Datapoint sales office or Datapoint Corporation, Attention Product Marketing, 9725 Datapoint Drive, San Antonio, TX 78230; (512) 699-7151. *Circle No. 148.*

COBOL, which is one of the most common languages for use in business system programming, is now available for Cromemco's Z-80 based microcomputer systems. Cromemco COBOL is based on American National Standard X3.23-1974, so users have access to the large number of programs written in COBOL.

Cromemco COBOL includes all ANSI Level 1 features for the Nucleus and for Sequential, Relative, and Indexed file handling; Table handling; Library; and Inter-program Communication facilities. Cromemco COBOL also includes the most useful Level 2 options such as the verbs STRING, UNSTRING, COMPUTE, SEARCH and PERFORM; abbreviated and compound conditions; and condition names.

Cromemco COBOL is available on 5" (Model FDC-S) or 8" (Model FDC-L) IBM-format, floppy diskettes for $95.

For additional information contact Cromemco, Inc., 280 Bernardo Avenue, Mountain View, CA 94043; (415) 964-7400. *Circle No. 191.*

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CIRCLE 34

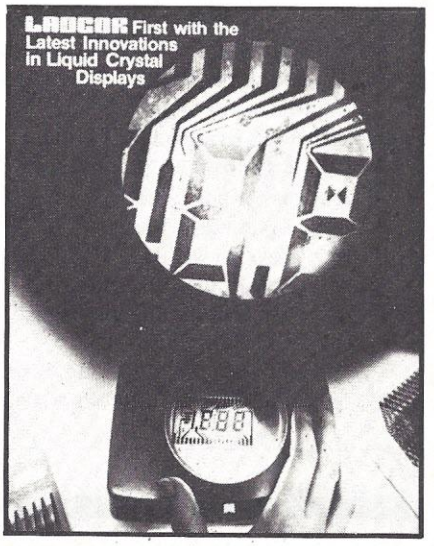
Literature

A new brochure entitled **Low Cost Digital Tape Transport Systems** is now available from Micro Communications Corporation in Waltham, Massachusetts. Micro is a manufacturer for OEM Tape Transports and Systems. For more information, contact Maurice W. Kirby, Marketing Manager, Micro Communications Corp., 80 Bacon Street, Waltham, MA 02154; (617) 899-8111. *Circle No. 119.*

A 4-page brochure describes the broad line of **liquid crystal display products** available from Ladcor.

In addition to the line of displays which Ladcor supplies to the watch and clock industry, the brochure also describes their line of displays available for applications that require displays capable of being multiplexed.

Inasmuch as a large percentage of the LCD programs require "custom" displays the brochure makes a strong point regarding the "custom" design and production capability of Ladcor. Ladcor is a wholly owned subsidiary of The Lausanne Organization S.A.



For further information on the brochure or the company contact Donald B. Rogers, Vice President-Marketing, Ladcor, 348 E. Middlefield, Mountain View, CA 94304; (415) 969-8295. *Circle No. 118.*

Molex Incorporated is proud to announce that their new eight page, 4-color, Distributor Brochure is now available. This brochure features the complete **Molex product line** which has recently expanded. Included are connectors, terminals, switches, sockets, cable, headers, application tooling and interconnection systems available through Molex's nationwide distributor network.

For more information, contact Allen Maag, Molex Inc., 2222 Wellington Court, Lisle, IL 60532. (312) 969-4550. *Circle No. 117.*

Apple Computer Inc. announces an easy to read manual for its Apple II computer system. Entitled **Apple II BASIC Programming Manual**, the book was authored by Jef Raskin, a computer professional who has written and lectured extensively on the subject of computer science to both the novice and the professional.

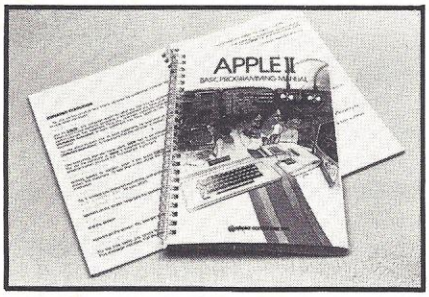
CIRCLE 35

The book assumes no prior background in programming or computers. Programming is explained in everyday English with no computer jargon used. Moreover, the book introduces the whole computer to the reader. Thus unlike programming manuals that solely teach a language, this book teaches a language in the context of the computer in which it will be executed.

Another feature is the book's graphic illustration and literary style. Using a two-color process with text in black, significant information is highlighted in eye-catching green. Moreover, to illustrate displays, actual television displays are used to assure the reader that observations on the television monitor will be the same as those within the book.

The manual is comprised of four chapters. Chapter 1 guides the reader through the details involved in connecting the various Apple II system elements, television, tape cassette player, etc., and describes the computer's control functions. The second chapter starts the reader programming with the BASIC Programming Language using simple, colorful examples.

Chapter 3 moves the reader into writing complete BASIC programs by providing detailed information on most BASIC language commands. Finally, the last chapter describes strings, arrays and subroutines for the reader who has acquired an understanding of the BASIC language and is ready to write more extensive programs.



Throughout the manual there is a conscious attempt to supply information on the BASIC language in an entertaining, thought provoking manner, and to foster a programming style.

The manual is presently available from Apple dealers for $5.95 each and is supplied free of charge with each Apple II computer. For more information, contact Mike Markkula, Apple Computer Inc., 10260 Bandley Drive, Cupertion, CA 95014; (408) 996-1010. *Circle No. 116.*

A seventy-page, convenient, pocket-sized **compatibility listing** of Nashua's complete line of disc packs, cartridges and diskettes is available from Nashua Corporation. The booklet includes a description of Nashua part numbers and overall media characteristics. Also included are criteria to help a service representative evaluate whether standard, certified error-free or mapped disc packs are required for a given application; listings include the name of the marketing company and the manufacturer for each disc drive in common use, drive model number, the manufacturer's

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INTRODUCTION TO MICROCOMPUTERS AND MICROPROCESSORS

Arpad Barna, *Hewlett-Packard Laboratories, Palo Alto,* & **Dan I. Porat,** *Stanford University*

The authors give you a balanced discussion of basic hardware and software, integrating the two through a broad range of topics. They describe the basic structure of a microcomputer, arithmetic operations and circuits, central processor and control units, and basic programming techniques. They also include information on input/output, memory, assemblers, loaders, data structures, and subroutine linkages. Over 120 examples facilitate self-study and each self-contained chapter allows you to select material of your interest. (1-05051-2) 1976 108 pp. $11.95

MICROPROCESSORS
Technology, Architecture, and Applications

Daniel R. McGlynn, *U.S. Phillips Corp.*

This introduction to the "computer-on-a-chip" gives a clear explanation of this important new device. It describes the computer elements and electronic semiconductor technologies that characterize microprocessors, and presents an overview of the architectures and operations of various popular commercial microprocessors. Useful, actual examples of microprocessors include a low-cost home computer and automotive and telecommmunication applications.

(1-58414-2) 1976 207 pp. $13.75

MICROPROCESSORS IN INSTRUMENTS AND CONTROL

Robert J. Bibbero, *Process Control Division, Honeywell, Inc.*

Bibbero gives you the background necessary to apply the microprocessor and its associated chips to an instrumentation or control system. Assuming that you have little or no knowledge in either of these areas, Bibbero introduces the background elements, paying particular attention to the dynamics and computational instrumentation required to accomplish real-time data processing tasks. He emphasizes system and software development, gives a look at advanced digital algorithms, and offers a stimulating chapter on distributed microprocessors.

(1-01595-4) 1977 301 pp. $15.75

MICROPROCESSORS AND MICROCOMPUTERS

Branko Souček, *State University of New York, Stony Brook; Institute Ruder Bošković, Yugoslavia*

Here's a thorough, detailed description of the application, programming, and interfacing techniques common to all microprocessors. It concentrates on detailed descriptions of representative microprocessor families and includes explanations of digital codes, logical systems, and microcomputer organization.

(1-81391-5) 1976 607 pp. $24.50

MICROPROCESSOR ARCHITECTURE AND PROGRAMMING

William F. Leahy, *Pacific States University & Rockwell International*

Because of its step-by-step approach and easy-to-understand language, you'll find this book an outstanding guide to the components and techniques associated with the microprocessor. Leahy's presentation begins with classical computer architecture and continues through the hardware of the microprocessor to the programming techniques and algorithms associated with this technology.

(1-01889-9) 1977 237 pp. $21.25

DIGITAL DESIGN WITH STANDARD MSI AND LSI

Thomas R. Blakeslee

This book gives you a complete design approach to today's MSI and LSI circuits. It shows you how to use standardized bargain components to handle most system requirements and how LSI and MSI building blocks can be traded off with other mechanical and electrical components for an optimum result.

(1-07937-5) 1975 357 pp. $23.95

Available at your bookstore or write to John V. Storojev, Dept. 3357.

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CIRCLE 36

disc pack number, bits per inch, tracks per inch, sectors, additional comments and the compatible Nashua product. This booklet will no doubt become a valuable reference tool.

For more information, contact Nashua Corporation, 44 Franklin St., Nashua, NH 03061. *Circle No. 158.*
Continued on p. 126.

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The stripping blade is easily replaceable. Available for wire sizes from 20 to 30 AWG (0, 8-0, 25 mm). For more information contact O.K. Machine and Tool Corp., 3455 Conner Street, Bronx, NY 10475; (212) 994-6600. *Circle No. 153.*

First Watch, a **watch and learning aid materials** designed to teach children from five to seven years old to learn to read any watch or clock, has been introduced by Texas Instruments Inc.

The First Watch scientific system offers a microelectronic digital watch and two learning aids. The First Watch package includes a specially styled, colorful LED watch, a Hands of Time learning dial and a "fun games and how-to" book – all structured to help youngsters learn both analog and digital timekeeping – and enjoy doing it.

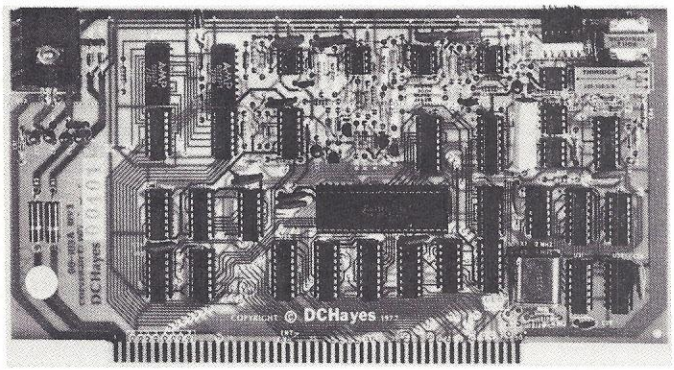
"Digital time is here to stay," a TI spokesman commented, "but today's youngsters still need to know how to read conventional 'big hand-little hand' time."

The Hands of Time dial, which can be used as an independent learning or games-playing instrument, enables children to dial any time of day and see it expressed both in numbers and with hands. The dial is also used to play some of the games.

Texas Instruments First Watch carries a suggested retail price of $19.95. Batteries are included with the watch.

For more information contact, Tex-

modem / 'mo • dəm / [**mod**ulator + **dem**odulator] *n* - *s* : a device for transmission of digital information via an analog channel such as a telephone circuit.



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CIRCLE 37

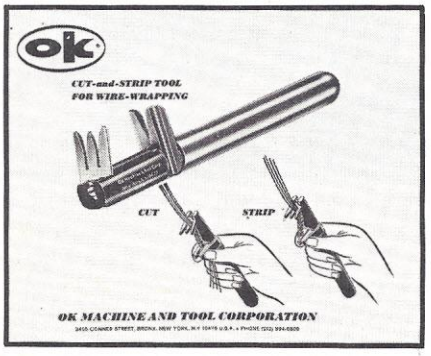
as Instruments Incorporated, Consumer Relations, P.O. Box 53 (Attn: LED Watches), Lubbock, TX 79408. *Circle No. 167.*

Fairchild Camera and Instrument Corporation's **video entertainment system** permits individual game programming via an optional plug-in keyboard.

The Channel F System II uses a new series of Videocarts capable of being programmed for game variables by means of a 16-button keyboard that plugs into the cartridges. In addition, System II uses the existing library of 21 Fairchild Videocarts for Channel F consoles.

In operation, a Videocart is inserted in the console much as a stereo tape cartridge is placed in a tape recorder. If a programmable Videocart is used, game variables – such as speed of players or type of play – are programmed into the cartridge with pre-selected keyboard numbers. The first programmable Videocarts are Space Odyssey, Pro-Football and Casino Poker.

The Channel F System II Video Entertainment Computer incorporates FM sound that is played through the television receiver's speaker. Other features include remote, detachable, eight-way hand controllers with 8-foot cords and a 10-foot console-to-TV cord. A switch on the underside of the console permits selection of TV channels 3 or 4 for game play, depending on which is unused in an area.



Channel F System reproduces games and other formats in full color on a color television screen. Game selection is made through the console and mobile screen elements are manipulated with hand controllers.

With standard Videocarts, the player may select from up to four difficulty modes, four time limits and variations of a particular game. Score and elapsed time are displayed on the screen where pertinent.

A "freeze" switch on the console permits interruption of play for an indefinite length of time, with the play being resumed at the press of the start button. Normal TV may be viewed during the interruption.

The Fairchild Channel F System II can be used with any make or size of television receiver, either color or black and white. Suggested retail price for the console is $149.95, including one Videocart. The keyboard attachment retails for $9.95 and keyboard Videocarts are $24.95. Standard Videocarts sell for $19.95.

For more information, contact Fairchild Camera, and Instrument Corp.,

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CIRCLE 38

Video Products Div., 3105 Alfred St., Santa Clara, CA 95050; (415) 962-3617. *Circle No. 161.*

Systems Furniture has a complete new line of Data Desk II **work stations and consoles** designed to accommodate most office computer and work processing systems.

According to a company spokesman, "The Data Desk II enables users to integrate office furniture with their computer to create a data processing center with a complete, modern office environment." This desk and work station system provides the user with a choice of four sizes: 24" wide x 30" deep, 48" wide x 30" deep, 60" wide x 30" deep and 72" wide x 30" deep.

Besides modular options, also available with Data Desk II are desk returns, modem shelves, and two sizes of desk mounted electronic bays and a stand-alone enclosure that are 19" rack mountable. Other options include storage pedestals, drawer pedestals (two and three drawer), AC power strips and cable raceways. The Data Desk II and modular components are available in most popular colors.

For more information contact Charles Schroder, Vice President, Systems Furniture Company, 13900 S. Figueroa Street, Los Angeles, CA 90061; (213) 327-4000. *Circle No. 157.*

Datamedia Corporation of Pennsauken, NJ, has solved the glare problem of VDTs by adding to the display terminal a filter produced by SGL Homalite from CR-39 thermosetting plastic monomer by PPG Industries.

The filter, called H-911, has a low-reflectance surface which is cast into

the material and will not chip, peel or rub off. Light transmission through the filter is not affected by the low-reflectance surface.

For more information, contact PPG Industries, Inc., One Gateway Center, Pittsburgh, PA 15222; (412) 434-2499. *Circle No. 156.*

A series of portable **bench top fixtures** for assembling printed circuit boards has been introduced by Product Systems Company.

Product Systems Circuit Board Assembly Fixtures, Model 189 Series, are portable production aids that securely hold one large or several small PCBs during lead cutting, bending, soldering

STAND ALONE **VIDEO TERMINAL**

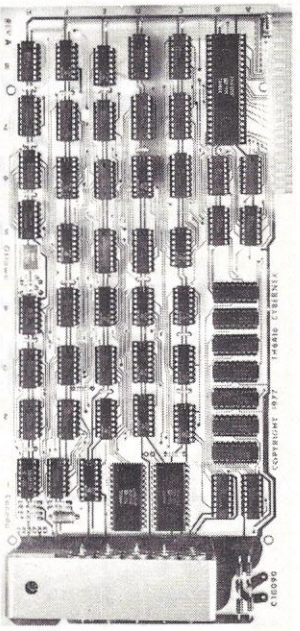
Now, a completely self-contained video terminal card for less than $150.00. Requires only an ASCII Keyboard and TV set to become a complete interactive terminal for connection to your computers serial IO port. Two units available, common features are: single 5V supply, crystal controlled sync and baud rates (to 9600 baud), computer and keyboard operated cursor control, parity error and control, power on initialization, forward spaces, line feed, rev. line feeds, home, return cursor, and clear to end of line. Power requirements are 5V at 900ma, output std. 1V p-p video and serial TTL level data.

Features:	TH3216	TH6416
Display	32 characters by 16 lines 2 pages	64 characters by 16 lines scrolling
Characters	Upper case ASCII	Upper/lower case optional
Baud Rates	300-9600	110-9600
Controls	Read to/from memory	Scroll up or down
Price (kit)	$149.95	$189.95

Above prices include all IC sockets

OPTIONS:

Power supply (mounts on board) $14.95
Video/RF Modulator, VD-1 . . . . . 6.95
Lower case option (TH6416 only) 14.95
Assembled, tested units, add 60.00



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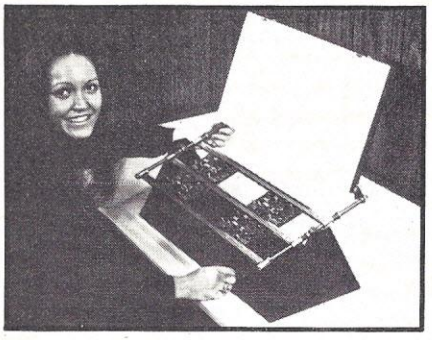
CIRCLE 39

and inspection. Adjustable spring rails facilitate loading and unloading, and a foam-lined hinged cover retains components up to 1.5" high. A spring loaded push button allows the circuit board assembly to rotate, exposing the component leads.



All Product Systems Circuit Board Assembly Fixtures provide a two position stop, allowing the user to select the most convenient working angle. Constructed of steel and aluminum, the fixtures are offered in three standard models: Model 189 for boards up to 9" x 20"; Model 189-12 for boards up to 12" x 20"; and Model 189-15 for boards up to 15" x 20".

Product Systems Circuit Board Assembly Fixtures, Model 189 Series, are priced from $98 to $181 each, depending on model and quantity. Special designs can also be supplied.

For more information, contact Product Systems Company, Arthur A. Jordan, Marketing, 2 Lowell Ave., Winchester, MA 01890; (617) 729-4800. *Circle No. 160.*

An innovative electronic **spelling aid** that uses word/picture association techniques has been introduced by Texas Instruments Incorporated.

Spelling B, a handheld learning aid with a colorful picture book designed for children six years old and up, contains 264 common words carefully selected with the help of leading educators. The words are taught through word picture association and imaginative games.

When Spelling B's "go" button is pressed, it randomly selects and displays the number of one of 264 words in its memory – each word describing a familiar object that is shown as a four-color illustration in the accompanying picture book.

A child uses the number to find the right picture and spells the object's name by pressing Spelling B's alphabet keys. The words, having a maximum seven letters each, appear on the unit's visual display, letter by letter, as each letter is keyed in.

Spelling B then signals "right" or "wrong" on the display screen, giving the child a second chance. If the second try is wrong too, Spelling B shows the correct spelling. Scores are given after each set of five words.

Spelling B, complete with instructions, game book and a fold-up carrying case, is offered at $30.

For more information, contact Texas Instruments Incorporated, Consumer Relations, P.O. Box 53 (Attn: Learning Aids), Lubbock, TX 79408. *Circle No. 155.*

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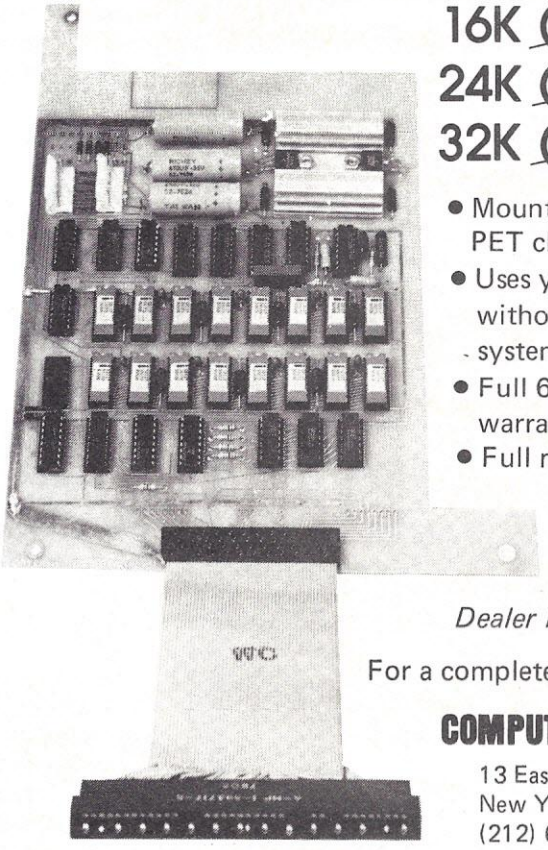

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CIRCLE 40

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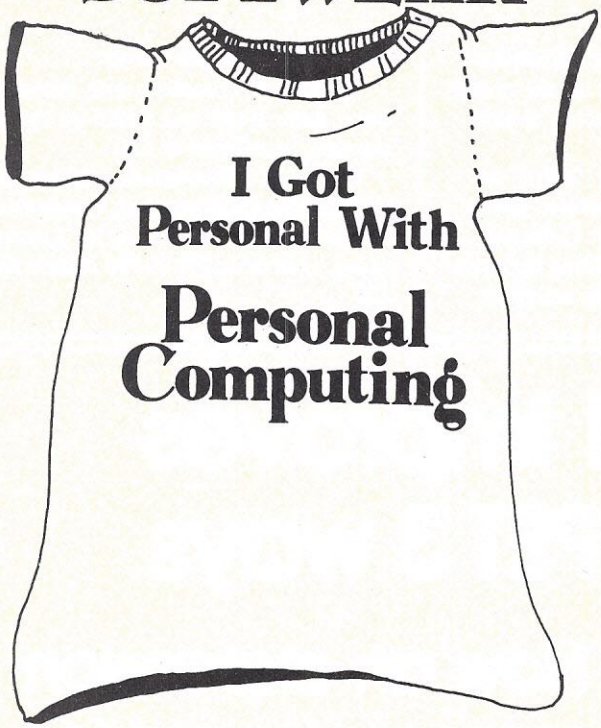

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Literature *continued from p. 122.*

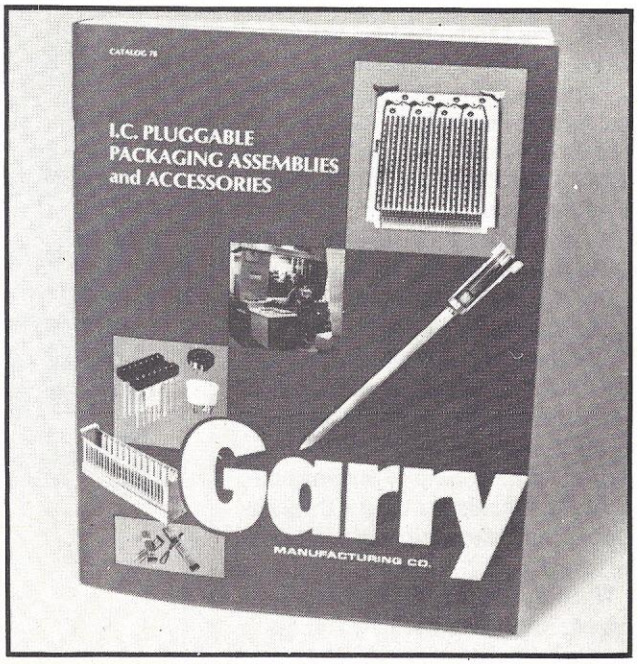
Intelligent terminals – those multifaceted terminals capable of supporting both data entry functions and distributed processing functions – is the topic of Auerbach's new publication – *Snapshot of Intelligent Terminals.*

Designed to enable buyers, users and manufacturers to determine which commercially available product is best suited to their needs, this comprehensive report covers the entire spectrum of intelligent terminals from simple interpreter-type terminals to those powerful models containing clusters of CRTs and printers.

The easy-to-read format of the Snapshot includes: a tutorial report detailing industry trends, selection criteria, and the evolution and characteristics of intelligent terminals; and product reports evaluating and analyzing intelligent terminals in terms of performance and competitive position, compatibility, users' reactions, configurations, software, data communications maintenance, and pricing. Over thirty major manufacturers are reviewed including: Burroughs, Datapoint, DEC, Four-Phase Systems, IBM, Sycor, Texas Instruments, and Univac.

The 180 page *Snapshot of Intelligent Terminals* by Auerbach is priced at $29.95 (plus applicable state sales tax). To order, or for more information, contact Auerbach Publishers Inc., 6560 North Park Drive, Pennsauken, NJ 08109; (609) 662-2070. *Circle No. 113.*

A new 72-page "Catalog '78," showing a complete line of **IC Pluggable Packaging Assemblies and Accessories,** is now available from Garry Manufacturing Company of New Brunswick, NJ.



The new catalog includes IC sockets and Headers, Stamped-Contact DIP receptables, Transistor Sockets, Standard Wire-Wrap Panels and Boards, Metric Size Boards, ECL and Schottky IC Packaging Panels, Card Cages and Backplanes with connector accessories, as well as Socket/Terminals and Pin Terminals. There is also a complete Microprocessor/Minicomputer Plug-Compatible Interface

Board section.

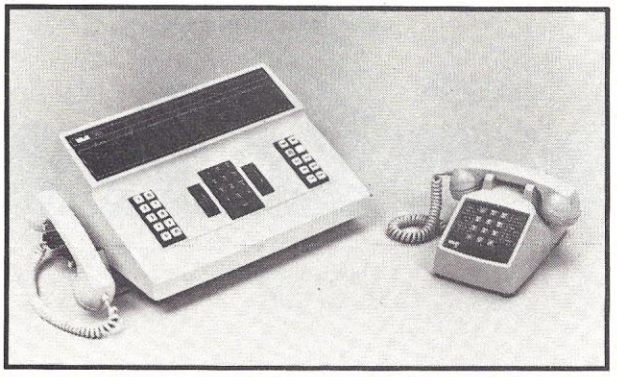
"Catalog '78" shows Garry's "total packaging concept" which includes their new Printed Circuit Board manufacturing facility and Computer Graphics capabilities along with their Wire Wrapping (Gardner Denver 14FV) department.

For more information, contact Harry A. Koppel, Executive Vice President, Garry Manufacturing Co., 1010 Jersey Avenue, New Brunswich, NJ 08902; (201) 545-2424. *Circle No. 110.*

Harris computer Systems has announced expanded capabilities for its virtual memory operating system with the introduction of a multi-user APL language. The new Harris implementation is functionally based upon APLSV (Shared Variables).

A concise, problem-solving language, according to the manufacturer Harris APL offers both simplicity of operation and almost unlimited power.

Along with its ability to handle vectors and multi-dimensional arrays with the same ease as single values, Harris APL allows the use of data files created by other languages. File I/O is managed by a system function that provides data management and manipulation abilities outside APL workspaces. This mode permits the use of files for exchange of information be-



tween such other standard Harris languages as FORTRAN, COBOL, RPG, SNOBOL, and BASIC-V. As a result, Harris APL is practical for business, scientific, education and engineering applications.

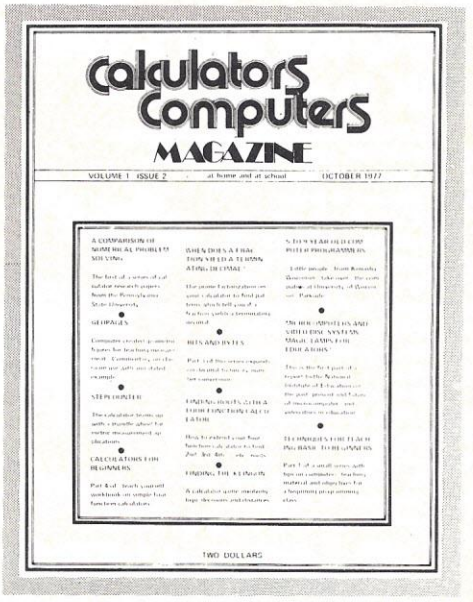
Additionally, Harris APL features a powerful editor, a calculator mode, and debugging functions. System commands are implemented to maintain libraries, perform status displays, send messages to other users, and communicate between programs. A public library containing functions for file manipulation is also provided.

A one-time license fee of $14,000 is applied to the software product. In addition, an annual maintenance fee of $1,200 applies after the first year of installation. First deliveries of Harris APL are expected in the 4th Quarter, 1978. For more information, contact Bob Freytag, Harris Corporation, 1200 Gateway Drive, Ft. Lauderdale, FL 33309; (305) 974-1700. *Circle No. 152.*

A 16-page brochure, **"HP 1000 Computer Systems,** Computational capability for science, engineering, and industry", describes, primarily through real applications, how Hewlett-Packard computer systems are used to solve

Calculators Computers

The How-To-Do-It Magazine



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CIRCLE 42

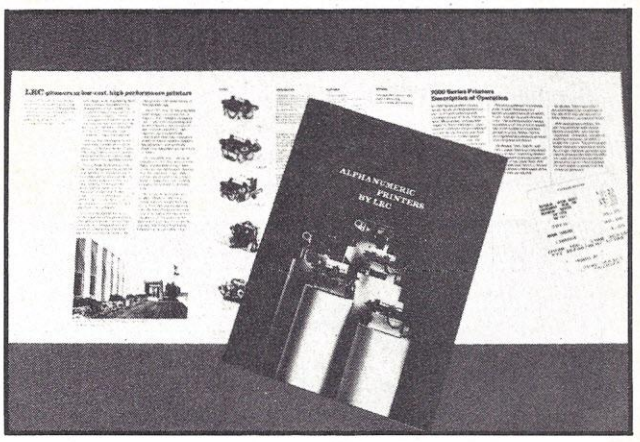
For immediate service from advertisers in this issue, use postcards on pages 37, 59, 77, and 99.

problems in a variety of industries. It is available free of charge from HP.

Case histories in the brochure, pub. #5953-3001 (22), illustrate applications in environmental research, cost analysis, computer modeling, research and development, mapping, vibration analysis, electronic testing, computer-aided design and product testing.

The brochure also discusses hardware and software features that are particularly useful in applications that involve rapid processing of large amounts of numbers. For more information, contact Inquiries Manager, Hewlett-Packard Company, 1507 Page Mill Road, Palo Alto, CA 94304; (415) 856-1501. *Circle No. 109.*

A new 6-page folder on **LRC alphanumeric** dot-matrix impact printers for point-of-scale terminals, electronic cash registers, banking terminals and other systems gives descriptions and features of the company's five basic



models. For more information, contact Mr. Robert Erickson, LRC, Inc., 99 E. Magnolia Blvd., Burbank, CA 91502; (213) 848-5556. *Circle No. 108.*

Systems *Continued from p. 96.*

System 4, a **small business computer**, introduced by Decision Data Computer Corporation last fall, is a microprocessor based system that offers concurrent batch and interactive operations, RPG II and tutorial processing. The input/output devices available include: disk, IBM compatible diskette, serial and line printers, data recorders, CRT workstations and communications equipment.

Among the other products being displayed for the first time on the West Coast are the new 3240 Printer Terminal and 6540 Serial Printer, which were introduced at the same time as System 4. The 3240 Terminal is being marketed as a time sharing terminal, system console or console/output printer for minicomputers or small business systems. The 6540 Printer is an output printer for a small computer or video display terminal.

Taking advantage of its 70 city sales/service organization, Decision Data is taking a unique marketing approach with its entries in the highly competitive printer terminal market. Service at point of installation is provided for units sold to end users directly or through OEMs and dis-

tributors.

The other member of Decision Data's family of new products, the CS 780 Data Communications Terminal, is also being publicly introduced to the West Coast business community at the same time. Designed to emulate the IBM 2780, the new Decision Data unit combines basic batch terminal capabilities with card data entry to produce a "workstation" effect that includes keypunching, verifying, card reading, punching and interpreting and line printing at rates up to 900 lpm.

The modular design of CS 780, resulting from the separate packaging of controller, printer and card devices, has drawn interest from a latent segment of the printer market. The users who form this market print data at a central location and then forward the documents to remote locations. By installing the smallest CS 780 system, consisting of a printer and a controller only, at any remote location the user can produce the same documents at the point of use with time savings measured in days. For more information, contact Decision Data Computer Corp., 100 Witmer Road, Horsham, PA 19044; (215) 674-3300. *Circle No. 106.*

BASIC/FOUR System 200 can now be expanded to accommodate a **second video display terminal** (VDT) with an additional 8K of system memory, according to Carl Jeremias, Vice President of Marketing for Basic/Four Corporation, an MAI company.

An optional feature, the second VDT is priced at $3200.

In its standard configuration, the System 200 consists of a BFC-manufactured central processing unit with 32K memory, one video display terminal, a 10 megabyte fixed media Winchester-type disk, one single track 2.5 megabyte cartridge tape drive and a 120 character-per-second bi-directional printer. The combined hardware/software system sells for $29,000.

Another new optional feature of the system is a 4-track, 9.2 megabyte tape cartridge at $225.

An additional 10 megabyte disk drive can be added to the system for a total disk capacity of 20 megabytes. The optional disk capacity is priced at $8000.

The new options are available for delivery with systems ordered after June 1.

A bundled business computer, the System 200 features a nine module software package for handling all routine office accounting functions such as general ledger, sales analysis, purchase order processing, fixed assets, payroll, accounts payable and receivable and inventory control.

Unlike systems from competing manufacturers, the System 200 software does not require a specially written code. Instead, the software is based on "modularization" and "parameterization" which permits a user to tailor any or all of the nine application modules to his requirements within certain parameters without tampering with the basic code. For more information, contact Basic/Four Corporation, P.O. Box C-11921, Santa Ana, CA 92711; (714) 731-5100. *Circle No. 104.*

DIGI-LOG has recently introduced its new "brilliant" **terminal system** which they claim puts Microterm II in a new terminal class, a step ahead of intelligent. The brilliant terminal class, as DIGI-LOG defines it, fills the price

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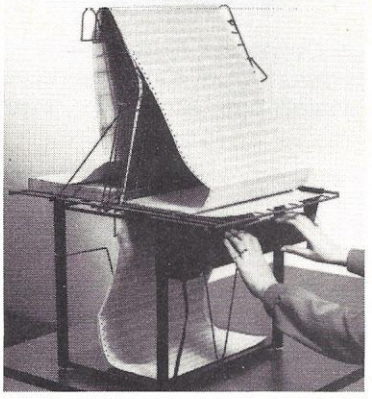

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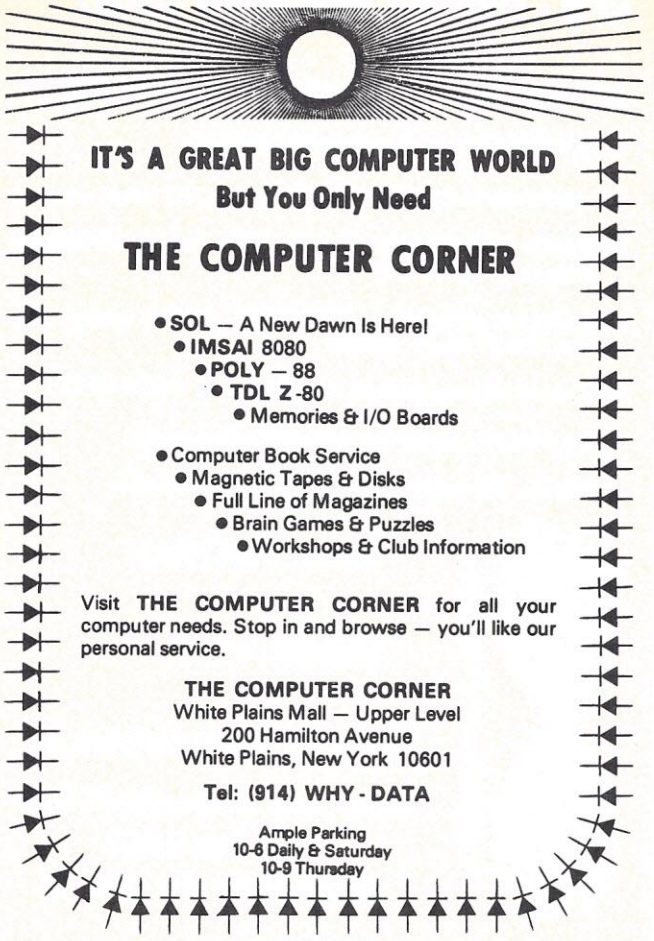

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BILLINGS

CIRCLE 47

performance gap between minicomputers and intelligent terminal systems. Microterm II's new system software package includes Multi-Tasking, ISAM (Indexed Sequential Access Method), Diskette File Control, Sort Capability, IBM 2780 and TTY communications emulators, utilities and an enhanced interactive software development system.

OEMs and large users can program applications from the Microterm II keyboard in interactive Extended Business BASIC or assembly language. User programs can be linked to all of the utilities and control packages furnished by DIGI-LOG in the new brilliant system.

Microterm II is an integrated desk top workstation not much bigger than a typewriter. Its hardware design includes dual microprocessor DMA architecture with up to 80K RAM memory, a full 24 x 80 line CRT, program keyboard, and single or dual mini-diskettes with up to 784K bytes of storage. A typical dual diskette configuration sells for $4950 in quantities of 100.

DIGI-LOG SYSTEMS is a manufacturer of microsystems for computer networks and data communications. For more information, contact DIGI-LOG SYSTEMS, INC., Babylon Road, Horsham, PA 19044; (215) 672-0800. *Circle No. 107.*

The modular design of CS 780, resulting from the separate packaging of **controller, printer and card devices,** has drawn interest from a latent segment of the printer market. The users who form this market print data at a central location and then forward the documents to remote locations. By installing the smallest CS 780 system, consisting of a printer and a controller only, at any remote location the user can produce the same documents at the point of use with time savings measured in days. For more information, contact Decision Data Computer Corp., 100 Witmer Road, Horsham, PA 19044; (215) 674-3300. *Circle No. 164.*

A single-board programmable microcomputer system designed specifically for control applications has been developed by Dynabyte, Inc., a Palo Alto manufacturer of S100 bus microcomputer components and systems.

The Basic Controller can manage electrical systems in a building, automate the control of laboratory test equipment, operate a model railroad train and apply itself to hundreds of other applications.

The unique feature of the Basic Controller, according to Dynabyte, is that it allows the user to operate the computer and the external devices it controls with a BASIC language called ZIBL which was written by Dynabyte specifically for control applications.

Dynabyte divides the control world into six categories: sense inputs, flag outputs, lites, relays, analog to digital and digital to analog. ZIBL implements 64 channels of each in such a way that the user need not know anything more about them than their names.

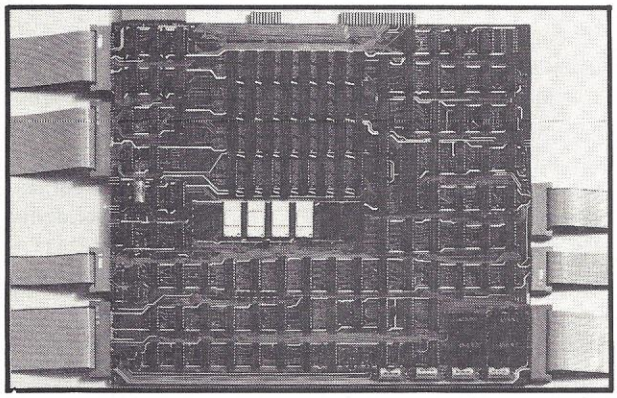
File structures allow multiple programs written in ZIBL to reside concurrently in RAM. Each program may be individually LOADed, RENAMEd or RUN. Any program may access another program as though it were a subroutine, while still retaining its own line numbers and variables.

Providing complete communications versatility, LIST-

ing, PRINTing and INPUTing may be done to or from any serial or parallel I/O channel or the self-contained CRT I/O.

Interaction with the Basic Controller is through the user's keyboard and video monitor that attaches to the printed circuit board.

On-board hardware includes a Z-80 MPU, 32 flags, 32 sense, 8 relays, 8 lites, 2 serial I/O, 1 parallel I/O, a cassette I/O, 64x16 video I/O, keyboard port, two 2716



sockets with programming capability, and up to 16K on-board RAM (4K included).

The Basic Controller retails assembled, tested and warranted one year for $750. For more information, contact Dynabyte, Inc., 4020 Fabian, Palo Alto, CA 94303; (415) 494-7817. *Circle No. 165.*

Cromemco's **System Three Computer** is suited for engineering, science, business/accounting, word processing, data-based management, education and medicine, according to the manufacturers.

System Three consists of a 4-MHz Z-80 based microcomputer, 32K RAM (two 16K cards) expandable to 512 kilobytes, RS-232 interface, parallel printer interface, CRT terminal with line editing and block mode transfer capabilities, and line printer with 132 columns.

Options include a PROM programmer, an additional dual disk drive providing a megabyte of disk storage, and additional memory.

Several provisions for protecting disks including software control for ejection of disks, a key switch to disable the disk eject buttons when in the LOCK position and motor-driven disk loading and unloading.

Software support includes FORTRAN IV compiler, 16K Z-80 BASIC, and Z-80 MACRO Assembler and Linking Loader. All software is available on standard, IBM-fromat, soft-sectored diskettes.

System Three mainframe costs $5990. The additional CRT is available in two models for either $1595 or with expanded capabilities including line editing and block mode transfer for $1995. The additional line printer comes as a 180 character/second model for $2995 and as a 60 character/second model for $1495. Cromemco, Inc., 280 Bernardo Avenue, Mountain View, CA 94040. *Circle No. 166.*

Major additions to its **business computer family** that significantly expand potential users in a broad range of companies were announced today by Data General Cor-

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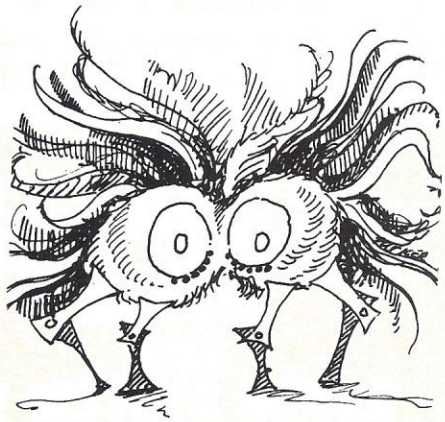
Science Fiction



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poration. The products, designated the CS/20 and CS/60, complement the minicomputer manufacturer's existing Commercial Systems product line by extending upward and downward the range of systems being offered.

The CS/20 is a desk-top unit designed for 1-3/4 million businesses with as few as four employees and revenues of $100,000 to $1 million. Many of these firms spend approximately $450 per month on accounting, billing, inventory management and other data services. This includes retailers, wholesalers, manufacturers, professional practitioners such as doctors and lawyers and other small organizations.

The CS/20 is the only small business computer programmed in an "interactive" version of COBOL, one of the most widely used business languages. Programs developed on the CS/20 allow secretaries and clerical personnel to operate the computer in conversational dialogue. No computer training is required. Another advantage of the system is that it runs on standard electrical current.

The CS/60, the largest member of this product line, can be the sole business computer for firms in the $5-25 million sales range or handle the data processing needs of various departments in a major corporation. As many as 12 people from different work stations can operate the computer at one time.

These additions are to the CS/40 line of business computers, which was introduced last May. Prices range from $10,945 to over $150,000.

CS/20 applications include service and retail establishments for invoicing, accounts receivable and payable as well as payroll; real estate firms for rental unit management and commission accounting; and professional practitioners such as accountants for handling internal as well as client accounting, dentists and doctors for patient billing and scheduling.

A CS/20 system also can be used to enter and edit data at remote locations of larger companies. These applications require on-site processing with occasional transfer of data to and from central locations. Typical examples include insurance agencies, branch warehouse outlets or local sales offices, as well as shipping/receiving, production control and other departments in large manufacturing companies.

The new top-end CS/60 system offers larger organizations opportunities to store greater amounts of information and process it quickly and economically in dedicated or distributed system settings. The CS/60 system series includes three models based on an ECLIPSE processor. CS/60 systems simultaneously can support up to twelve users working on independent applications or accessing a common data base. System models can be specified with options that increase system efficiency. The CS/60 also can be used alone or in combination with other systems in a larger data processing facility.

To illustrate the ease of use, the CS/20 has only two front-panel switches – a keyswitch to start, stop, lock and reset the unit, and a screen brightness adjustment.

The user simply inserts one or more diskettes, waits for a light confirming that the unit is ready, and answers questions displayed on the screen to enter data or to ask

for more information.

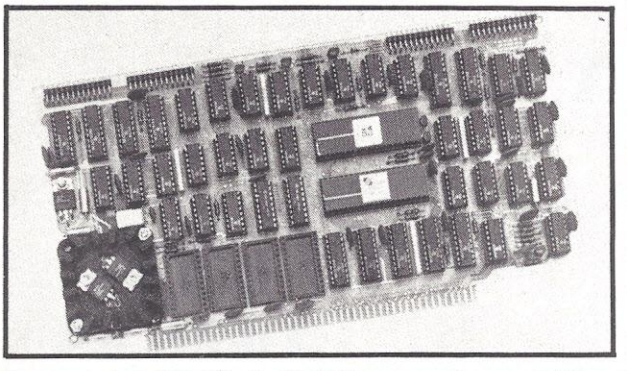
For more information, contact Data General, Route 9, Westboro, MA 01581; (617) 366-8911. *Circle No. 105.*

A bundled **business computer**, the System 200 features a nine module software package for handling all routine office accounting functions such as general ledger, sales analysis, purchase order processing, fixed assets, payroll, accounts payable and receivable and inventory control.

Unlike systems from competing manufacturers, the System 200 software does not require a specially written code. Instead, the software is based on "modularization" and "parameterization" which permits a user to tailor any or all of the nine application modules to his requirements within certain parameters without tampering with the basic code. For more information, contact Basic/Four Corporation, P.O. Box C-11921, Santa Ana, CA 92711; (714) 731-5100. *Circle No. 163.*

Cromemco's **Single Card Computer** is a complete computer which brings the power of the Z-80 and the flexibility of the S100 bus to the dedicated computer environment.

The card offers 4 MHz operation, 8K bytes of onboard 2716 PROM and 1K byte of static RAM memory. This stand-alone card also provides an RS232 (or 20mA current loop) serial interface with programmable baud rates to 76,800, 24 bits of bidirectional parallel I/O, 5 programmable timers and vectored interrupts Only a power supply and PROM software are required



for operation. The Single Card Computer is compatible with all Cromemco cards.

The Single Card can also be the core of an enormously expandable S100 bus system that can include additional memory, I/O or even floppy disk drives as required.

Cromemco's Z-80 Monitor and 3K Control BASIC are available in 2716 ROM for use with the Single Card Computer. With these two ROMs, the single card computer can be used immediately without any additional memory or I/O. The Monitor has 12 commands to aid in program development. The 3K Control BASIC has 36 commands/functions and can directly access I/O ports and memory locations as well as call machine language subroutines.

The Single Card Computer is available in kit for $395 and assembled and tested for $450. The Monitor and Control BASIC are available in two ROMs for $90. For more information, contact Cromemco, Inc., 280 Bernardo Avenue, Mountain View, CA 94040; (415) 964-7400. *Circle No. 103.*

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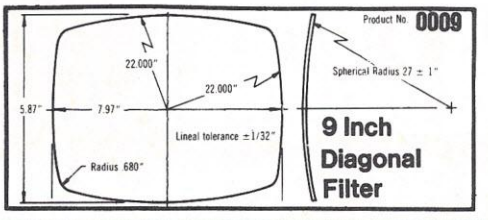

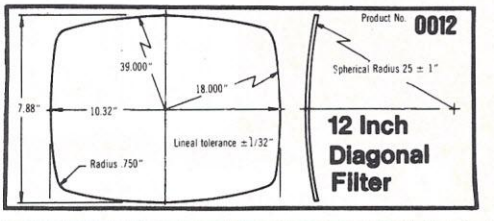

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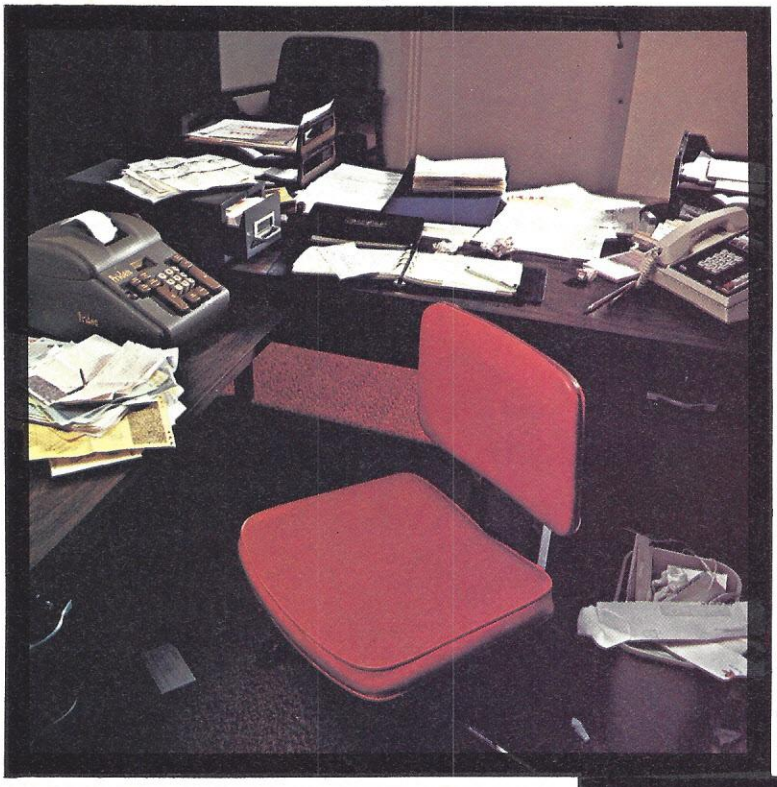

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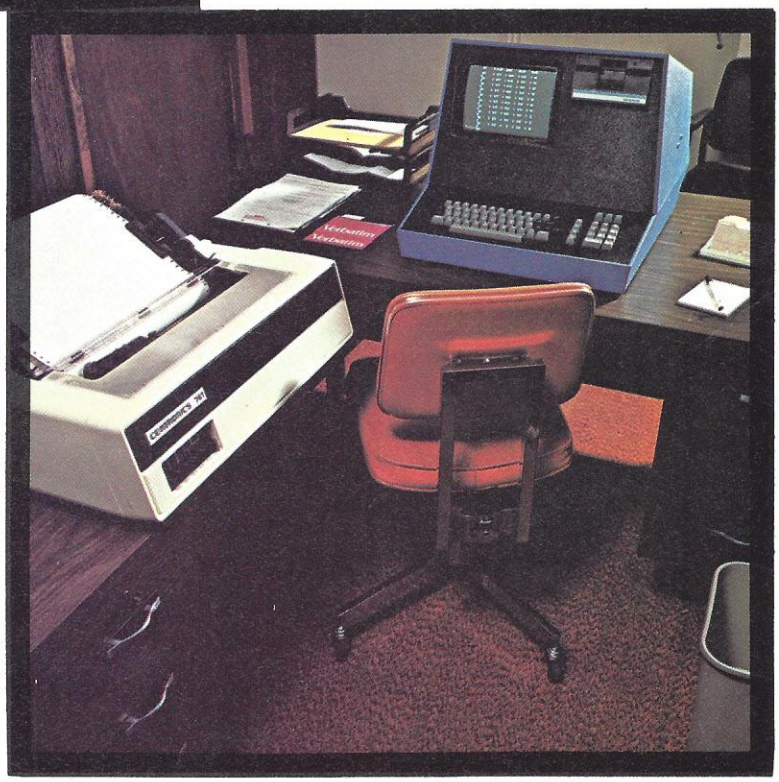

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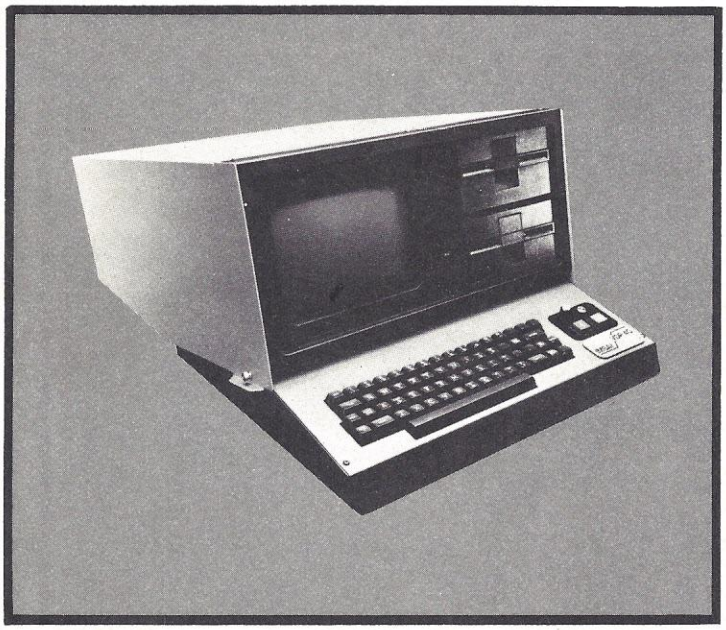

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